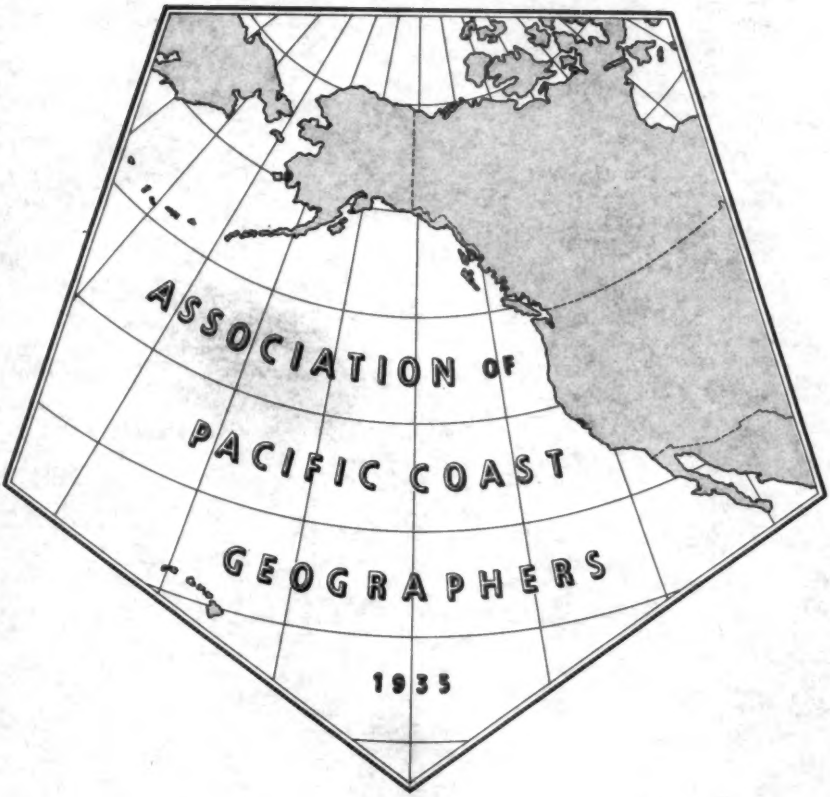
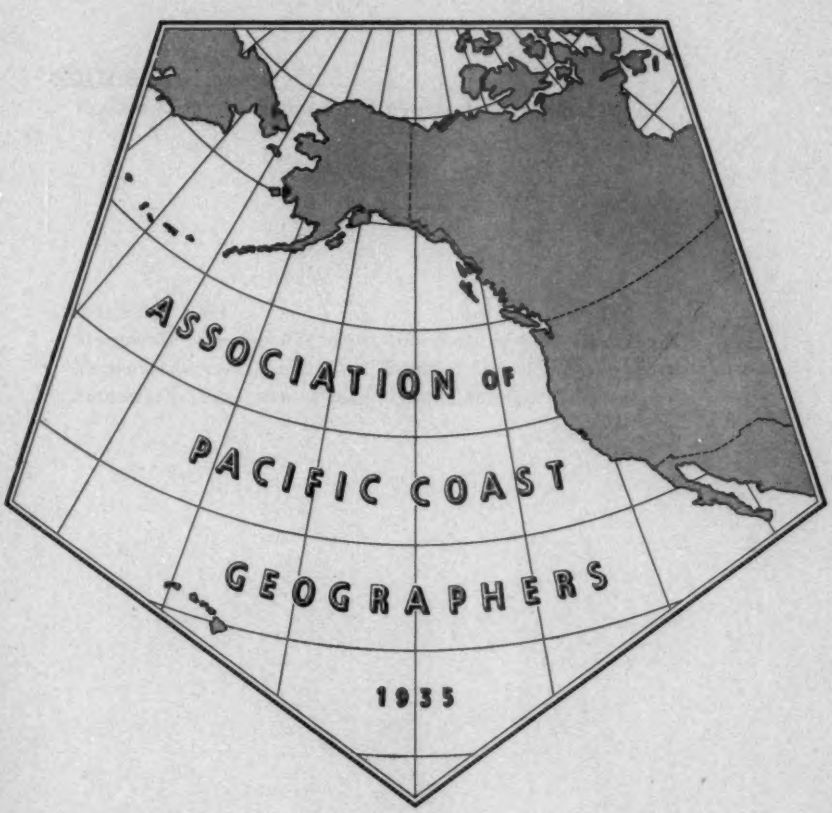


YEARBOOK

VOLUME 22 1960



AFFILIATIONS:

Association of American Geographers
American Association for the Advancement of Science
Pacific Division

VOLUME 22
1960

YEARBOOK

EDITOR
Frances M. Earle, University of Washington, Seattle

OFFICERS, 1960
PRESIDENT: *Howard F. Gregor, University of California, Davis*
VICE-PRESIDENT: *John O. Dart, Portland State College*
SECRETARY-TREASURER: *Paul F. Griffin, Stanford University*

Published by The Association
at the
University of Washington
Department of Publications and Printing

CONTENTS

Agricultural Intensity and Its Regionalization
Howard F. Gregor 7

The Core-Frame Concept and Some of Its Implications
Ronald R. Boyce 28

Cultural Landscapes of Portuguese India
David E. Sopher 34

Areal Political Structure and Its Influence on Urban Patterns
James E. Vance, Jr. 40

Cattle Feeding in the Imperial Valley
Robert A. Kennelly 50

Twenty-Third Annual Meeting 57

AGRICULTURAL INTENSITY AND ITS REGIONALIZATION

HOWARD F. GREGOR
University of California, Davis

Perhaps the most basic theme of human history has been man's increasing need for food and the effort he has expended in producing it. The intensity of this effort and its wide variance over the earth has been increasingly studied by both economists and geographers. The former have been especially concerned with the theoretical considerations of those factors which determine the distribution patterns of intensity;[1] geographers have been empirical, striving to discover the actual intensity patterns as they exist and the reasons for their existence. Both, however, have increasingly complemented the other, for the distribution of intensity is a product of economic "laws" and the physical environment, as well as historical circumstance.

Problems of Intensity Study

Intensity, then, is not a simple concept. As Olmstead notes, "The terms intensive and extensive farming are often used but infrequently defined."[2] The definition of agricultural intensity as the expenditure of labor and capital on land so as to obtain higher acre-yields[3] is simple enough; it is by itself inadequate, however, as a basis for statistical analysis. How shall these factors be defined? For example, does labor refer only to physical effort, or to capital as well (which is actually nothing but consummated labor)? If labor is considered only as a manual exercise, what will be its criterion—physical exertion, the number of people involved, the hours spent, or still some other indicator? Shall capital include just the more physical aspects of agricultural industry like machines, fertilizers, wages, and seeds; or shall it also embrace the less traditionally accepted, but no less important, elements such as skill and receptive attitude toward farm improvements? Even the concept of acre-yield lacks a clear definition. Will it be the amount of crop produced per acre, the number of calories per acre, or both?

---

* Presidential address of the Association of Pacific Coast Geographers, Eugene, Oregon, June 15, 1960.

The author should like to thank the many California agricultural commissioners and farm advisers for their cooperation in this study, and Miss Marilyn Kelsey for assisting him in the collection of data.

[1] Although small in relation to other works by economists, contributions to the spatial aspects of economic activity are rapidly growing. A review of the most recent and important of these writings is provided by William Garrison in "Spatial Structure of the Economy," *Annals of the Assoc. of Amer. Geog.*, 49 (June, 1959), 232-239.

[2] C. W. Olmstead, "American Orchard and Vineyard Regions," *Economic Geography*, 32 (July, 1956), 191.

[3] R. Laur, *Wirtschaftslehre des Landbaus* (2d ed.; Berlin, 1930), p. 141.

Finally, assuming the selection of certain criteria, how shall the total effort be statistically represented? Shall it be in money, points, or some other standard unit? And, once such a unit is chosen, how shall elements as diverse as, say wages and skill, be equated? Further, if this is solved, what shall be the weightings assigned to these elements as we attempt to arrive at an over-all indication of agricultural intensity? There is also the availability of statistics to be considered. Many agricultural regions, some of them extremely important producers, have had little or no statistical survey (parts of Southeast Asia). Nor does an abundance of statistical material necessarily guarantee their accessibility to the researcher. Governmental policy may make most of it inaccessible, as in the Soviet Bloc countries. And even if available, the data may still be difficult to analyze because of the lack of uniform criteria used by the reporting nations. One outstanding bit of uniformity is, in fact, more often a complication than a help. This is the custom of presenting statistical information by political units, the boundaries of which frequently ignore the delimitations of the geographic region.

Still other complications beset the study of intensity distribution. Besides the problem of definition and statistics, there is the fact that agricultural intensity is a composite of several intensities, each having an areal pattern that does not always coincide with the other. These intensity types are logically derived from the factors of production, and refer to land (or *yield*) intensity, labor intensity, capital intensity, and management intensity. Management intensity represents a combination of the other three, and is therefore a synonym for over-all agricultural intensity. It is high where capital and labor expenditures and both yields and net returns are large.[4] High management intensity occurs in only certain areas of the world, and none of them exceeds any other in all four of these intensity aspects. The principal center of yield intensity is in northwestern Europe; the area of highest capital intensity is divided among the American Middle West and our irrigated western oases; greatest labor intensity is in one of three places, depending on its definition—in Southeast Asia, if manual labor; in northwestern Europe, if a combination of manual labor and low labor costs; in the United States, if mechanized labor. Nor do the centers of highest net returns necessarily have to coincide with any one particular combination of intensities. Net gain is high in the United States because a high capital intensity more than compensates for a low yield intensity; net gain is also great in those parts of Europe where high labor intensity with low labor costs more than counteracts lower capital intensity.

The World Intensity Pattern

Despite all these complications, there is undoubtedly a definite world distributional pattern of agricultural intensity with a hierarchy of intensity centers. Furthermore, geographers and other specialists have been making steady progress in developing means of measuring the relative strengths of the various centers. The fact that there are only certain areas in the world where agricultural (i.e., management) intensity is high is explained in part by physical handicaps. Cold, drought, and unfavorable terrain doom the greater part of the land surface to sterility. But even in those areas suitable

[4] Erich Otremba, *Allgemeine Agrar- und Industriegeographie,* Vol. 3, *Erde und Weltwirtschaft* (Stuttgart: Franckh'sche Verlagshandlung, 1950-57), p. 94.

for use, the concentration of dense and industrialized population centers in only certain sections has further limited the extent of agricultural intensity. England, and later northwestern Europe, were the first centers of high agricultural productivity and advanced technology, with farming operations becoming increasingly more extensive as one moved away from those two regions. As industrialization and urbanization spread to other part of the world, other poles of intensity developed. Northeastern United States soon challenged the supremacy of Europe, to be followed by the rise of Japan and the even faster and more impressive advent of the Soviet Union.

Meanwhile, secondary intensity centers were developing: Uruguay and the Pampa, South Africa, southeast Australia and New Zealand, and the irrigated areas of our Far West, particularly in California. These areas first achieved importance through improvements in food preservation and transportation (refrigeration; increased speed) which enabled them to supply the markets of the primary intensity centers. Later, growing industrialization and population reinforced this intensity through strengthening of local markets (Buenos Aires, Los Angeles, Sydney, etc.). This proliferation of intensity concentrations has certainly not slackened. With improving agricultural technology and efficiency, China, India, and other densely populated but underdeveloped areas are now in a position to capitalize on their huge market and labor supply.

The growing number of intensity centers, their different and changing sizes, and their increasing overlaps make their present distribution pattern a much more difficult one to decipher than that of the nineteenth century. This increased complexity has encouraged many to disparage Von Thunen's thesis on spatial distribution of agricultural intensity,[5] a thing difficult to understand when it is remembered that a defined direction of intensity always predominates, no matter what the distribution pattern.[6] Otremba is quite correct when he observes that the German economist's intensity law is still the most important orientation principle in agricultural space, and that the many theoretical writings since his time have added nothing to essentially lessen its validity.[7]

If measurement of intensity patterns is hampered by statistical difficulties, it is not due to lack of efforts in this area. Both statistics and techniques for applying them to intensity studies are increasing. Of world-wide interest are the accumulating reports since World War II of the Statistical Office and the Food and Agriculture Organization (FAO) of the United Nations. Postwar activities of several European countries have been especially vigorous in the collection of agricultural data, for example, in Germany. Our own U.S. Census Bureau has been particularly active in amassing agricultural information since 1920.

New statistical techniques have proceeded apace. In their search for uniform measurement criteria, some German geographers have attempted to

[5] J. H. von Thünen, *Der isolierte Staat in Beziehung auf Landwirtschaft und Nationalökonomie* (Hamburg, 1826).

[6] A particularly good example of the persistence of recognizable intensity patterns despite the complications of rapidly changing land use and complex physical conditions is the southern coastal area of California around Los Angeles. H. F. Gregor, "Push to the Desert," *Science*, 129 (May 15, 1959), 5-7.

[7] Otremba, *op. cit.*, p. 23. Otremba also gives an excellent explanation of the von Thünen intensity law and considers it in the light of actual agricultural distributions, pp. 88-96.

derive index numbers by which crops and livestock may be compared as to economic value and labor intensity (Busch, Klauder). Böhme has used crop-index figures in an attempt to determine the productive ability of an area. More significant has been the use of ratios, in which all values are related to the next more general and comprehensive category. Engelbrecht in Germany pioneered this method just before the turn of the century, setting up relationships such as field crops and special crops to grain area and all domestic animals to livestock. Many geographers in that country, among them Troll, followed with other types of ratios. Baker capitalized on the rich data of the U.S. Census in applying Engelbrecht's methods to the United States in 1921. Later, Jones, Hartshorne, Dicken, and others expanded the types of ratios still further. Although these studies were concerned with the charactization and delimitation of agricultural regions rather than the outlining of over-all intensity patterns, their results have provided, indirectly, a better picture of intensity distribution than before. Measurement and mapping of intensity as such, through ratios, are now being encouraged as more monetary data on agricultural production, expenditures, and income become available.

Distribution of Intensity in California

It is apparent that every study of agricultural intensity patterns is faced with a multitude of problems—conceptual, statistical, and distributional. But intensity patterns do exist and the means for their discovery, mapping, and analysis are increasing. It is with this more encouraging note that I should now like to consider the distribution of agricultural intensity in California.

Like all important world centers of agricultural intensity, California has local variations of intensiveness, due to the very factors which fostered the general center: differences in the physical environment and in distance to markets. Both of these influences are particularly strong in the state. A large variety of climate-terrain combinations provide agricultural conditions ranging from extremely poor to amazingly good: cold temperatures and excessive precipitation in the northern mountains, but mild temperatures and moderate precipitation in the southern ranges; cool temperatures and heavy precipitation in the northern coastal lowlands, but mild temperatures and low precipitation in those of the south; warm temperatures and low precipitation in the Sacramento Valley, but higher temperatures and scanty precipitation in the San Joaquin and the "High Desert," with even hotter readings and less moisture in the "Low Desert" of the southeast. These are only some of the rudimentary differences. If such things as length of growing season, the particular temperature-moisture combination of the crop period, and soil conditions are also considered, the variations become almost innumerable.

Almost as varied as the physical environment, and, therefore, also strongly influential in shaping the state's intensity pattern, is the distribution of local markets. California has not only one of the largest state populations, but also one of the most unevenly distributed. Nowhere in the country are such high population densities located next to almost empty spaces. Four-fifths of the people live in just three small areas, with a distance of more than four hundred miles separating the two most populous concentrations. Furthermore, all three conurbations are eccentrically located. The Los Angeles and San Diego centers, with the largest mass of the state's population, also lie in the most peripheral position possible with regard to the rest

of the state. The San Francisco Bay Area is situated near the middle of the state, but is still off to one side. Big contrasts in the sizes of three population agglomerations make for equally big differences in market attraction. The greater Los Angeles has more than twice as many people as the Bay Area, and the latter has five times as many as the San Diego region.

Fortunately for our study, the statistical problems confronting most of the world, and which we have already mentioned, are much less troublesome in the United States. Statistics on a variety of agricultural topics are provided in abundance by the Census Bureau, with valuable auxiliary sources of data available from the state and county agricultural offices. America also has a highly commercialized economy, the type that is most faithfully represented by statistics. Some of the world's more intensive agricultural regions, as we know, offer few opportunities for statistical measurement because their largely subsistence economies pose major problems in quantification (manual, self-employed labor instead of mechanized, income-earning labor; home consumption or barter instead of cash sale; etc.). Finally, the statistics offered by the Census provide uniform criteria. Three census items—cropland, value of farm products sold, and farm labor and other expenditures—enable us to take at least a tentative step toward outlining patterns of agricultural intensity in California.

Cropland and Agricultural Regions. A necessary preliminary step in any agricultural intensity study is the determination of the amount of land that is being used. Once discovered, value of farm production and amount of expenditures can be related to the land-area unit so as to obtain an estimate of yield intensity and of capital intensity. To represent these and other intensity types on a map, isopleths would at first thought appear to be the best symbol. In an uninterrupted cropland area, such as the Corn Belt, they would be imperative for showing the areal differentiation of intensity; in a fragmented crop pattern, like that of California, however, it would seem more logical to compare intensities on the basis of geomorphic units, especially when each, or a combination of them, has a fairly homogeneous physical character and yet differs from the others. Seven broad agricultural regions may be outlined, most of which are popularly recognized: *Sacramento Valley; San Joaquin Valley;* the *North Coast,* which includes the coastal valleys from the San Francisco Bay Area northward; the *Central Coast,* comprising the coastal valleys from the Bay Area southward to the Santa Ynez Mountains, north of Santa Barbara; the *South Coast,* embracing the coastal lowlands from the Santa Ynez range to the Mexican border; the *Northest Interior,* involving the basins and valleys within and to the north and east of the Klamath-Cascade-Sierra Nevada mountain complex; and the *Desert,* which includes the lowlands of the southeastern part of the state and is here subdivided into the colder *High Desert* and the hotter *Low Desert* (Fig. 1).

While the boundaries of these regions are fairly easy to draw along major drainage divides, these occasional lack of correspondence with boundaries of reporting areas creates a statistical problem. This boundary discrepancy is a problem common to much of the West where, within the confines of one county, the standard reporting area of the Census Bureau, can be found several centers of highly intensive farming separated by vast areas of extensive agriculture. The same situation is often true even of the minor civil divisions used by the Census, their boundaries sometimes not only embracing

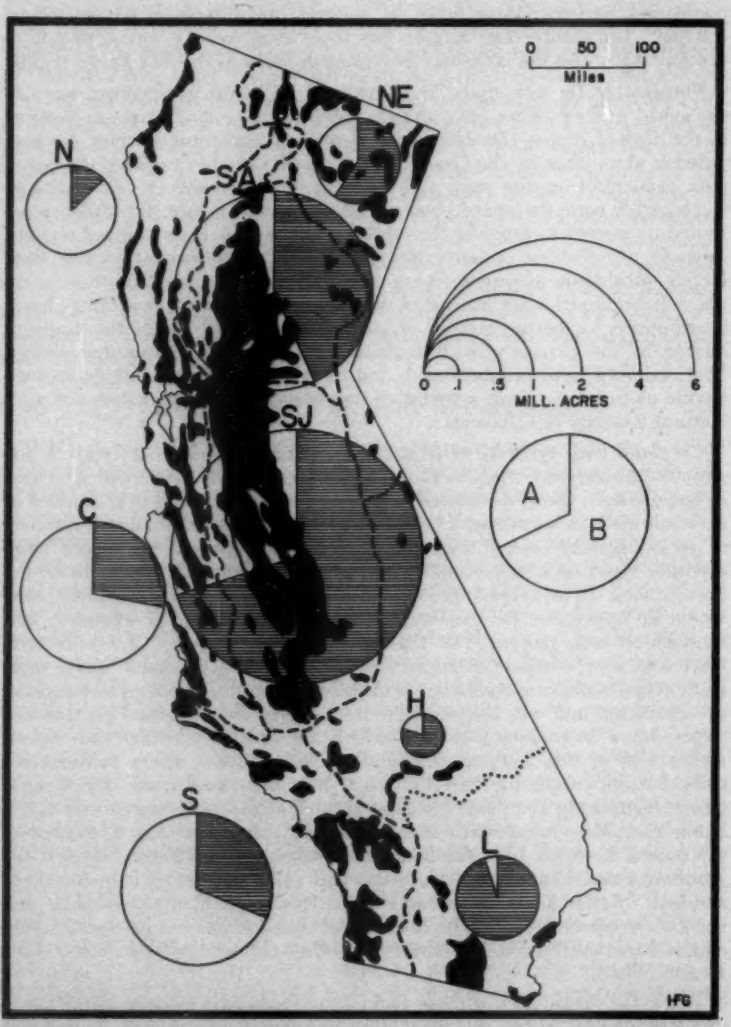


Fig. 1. Agricultural regions and cropland distribution. N—North Coast; C—Central Coast; S—South Coast; SA—Sacremento Valley; SJ—San Joaquin Valley; NE—Northeast Interior; H—High Desert; L—Low Desert. Circles proportional to regional cropland acreages: A—Irrigated; B—Unirrigated.

several areas of varying intensity, but cutting indiscriminantly across them. In California, complications of this kind are greatest in the south, where several of the principal counties include lands of both the South Coast and the Desert. Hence, to separate these two areas statistically, it was necessary to resort to sources other than the Census: state and county publication, unpublished materials, and private communications from county agricultural officials.[8] In some instances, even these aids were not enough, and rough estimates had to be made. For this, and other reasons to be mentioned later, all tabular statistics in this paper should be viewed more in a comparative, rather than exact, sense.

The distribution of cropland not only provides information required for the computation of agricultural intensity in the various agricultural regions of the state; it also is an indirect indicator of intensity, as well as serving as an excellent base of comparison with the several intensity patterns to be ultimately developed (Fig. 3). Most striking is the large amount of cropland in the San Joaquin Valley, forty per cent of the state's total of more than 13 million acreas, and almost twice as much as that of the next largest bloc, the Sacramento Valley (Table I). Although these two areas have well over half of the state crop acreage, sizeable areas are also to be found in both central and southern coastal regions. Cropland is much smaller in the areas of the North Coast, Northeast Interior, and Desert.

TABLE I

CROPLAND (IN ACRES)*

Region	*Total*	*Irrigated*	*% Irrigated*
San Joaquin Valley	5,324,711	3,737,227	70
Sacramento Valley	2,879,248	1,242,562	43
South Coast	1,694,543	529,791	31
Central Coast	1,661,663	466,027	28
Desert	707,872	651,956	92
a) Low Desert	(554,166)	(528,682)	(95)
b) High Desert	(154,720)	(123,274)	(80)
North Coast	614,950	79,863	13
Northeast Interior	565,181	334,223	59
Total	13,448,168	7,041,649	52 (state av.)

* U.S. Bureau of the Census, *1954 Census of Agriculture*, Vol. I, Counties and State Economic Areas, Part 33 (Washington: Government Printing Office, 1956), pp. 50-57.

Irrigation increases crop yields many times, so that the proportion of cropland irrigated is another oblique indicator of intensity. This proportion varies drastically, ranging from 95 per cent in the Low Desert to only 13 per cent

[8] Hydrographic boundaries have been used by state agencies in the regional presentation of agricultural statistics, although even here the information necessary for a determination of over-all agricultural intensity is lacking (value of production, expenditures). See the following: California State Water Resources Board Bull. 2, *Water Utilization and Requirements of California*, 1955; L. R. Wohletz and E. E. Dolder, *Know California's Land* (Sacramento, 1952); L. A. Crawford and E. B. Hurd, *Types of Farming in California Analyzed by Enterprises*, Univ. of Calif., Agric. Exper. Sta. Bull. 654, 1941.

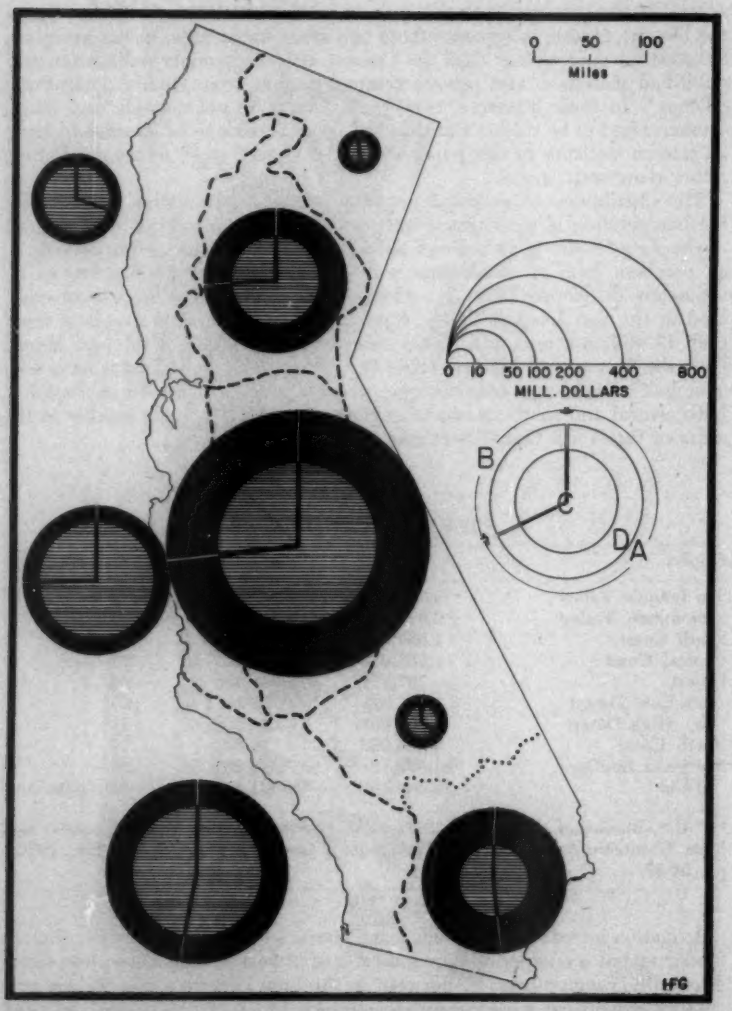


Fig. 2. Distribution of value of farm production less livestock and livestock products (A), value of farm production in livestock and livestock products (B), value of farm expenditures (C), value added by agriculture (D), and total value of farm production (C + D).

on the moist North Coast. The fact that the Desert, with just 5 per cent of the state cropland, also exceeds all our other regions except the San Joaquin and Sacramento valleys in irrigated acreage is a point to be remembered in later discussions. Except for the Desert and North Coast, the agricultural regions rank much the same in amount of cropland irrigated and proportion of cropland irrigated. With more than half of the state's irrigated land, the San Joaquin far surpasses all other regions. One somewhat surprising feature is the only average proportion of state cropland under irrigation —52 per cent. Only the Desert and San Joaquin Valley materially exceed this figure. The basic reason is the present unavailability of water to many crop acres. The large area of unirrigated cropland also reflects a still generally overlooked aspect of irrigation in the state, that application of water is basically more a reaction to high market prices than drought. Only in the Desert, the Northeast Interior, and southwestern corner of the San Joaquin is irrigation an absolute necessity for crop growth.

Yield Intensity. With the various amounts of cropland finally ascertained, we may now make our first major move to discover the regional pattern of over-all agricultural, or managerial, intensity. This will be the determination of the distribution of yield intensity, which can be the determination of the of the distribution of yield intensity, which can be expressed as the value of farm production per acre.[9] We must first find, then, the total farm production values (less those of forest products) of the principal agriculture regions.

Hints of high yield intensity are already plainly evident in California's position as the most productive farm state. All of the principal agriculture regions, except two (Northeast Interior and North Coast), exceed the total farm income of at least one or more *states.* Most impressive in this respect are the San Joaquin Valley, which led forty-one states in 1954, and the South Coast which outearned thirty-two. Nevertheless, there is a wide divergence among the regions in production, the San Joaquin contributing a third of the state agricultural income in contrast to only a little more than one per cent for the Northeast Interior (Table II). The answer lies in physical conditions and access to local market, as well as amount of cropland.

Warmth is the single most important physical factor in the regional distribution of farm income; its effect is best illustrated in fruit, the most profitable of all crop groups. Not quite half of the state acreage is in the San Joaquin Valley (45 per cent). That, plus an extensive cropland and a monopoly on the state's best money crop, cotton, make the valley easily the richest agricultural area. The second largest fruit area is on the South Coast, with 25 per cent of the state's fruit acreage. Even milder conditions here give this region a strong leadership in citrus, a more profitable fruit than the deciduous types. Sixty per cent of the navel oranges in the state and 90 per cent of the valencias are grown in the south coastal lowlands.[10] The favored position of the South Coast in fruit production is enough to put it

[9] Similar in principle but somewhat different in application is the "gross sales per acre" measurement used by the Census Bureau. Here the value of all farm products sold is related to the acreage of total land in farms. This type of production intensity is presented only for types of commercial farms. U.S. Bureau of the Census, *1954 Census of Agriculture,* Vol. III, Farmers and Farm Production in the United States, Part 9 (Washington: Government Printing Office, 1956), p. 43.

[10] Fruit acreage statistics from S. W. Shear, "State's Fruit Areas," *California Agriculture,* 8 (November, 1953), 3, 16.

TABLE II

VALUE OF FARM PRODUCTS SOLD*

Region	*Total*	*Less Livestock & Livestock Prod.*	*% of Value From Crop Only*
San Joaquin Valley	$924,857,277	670,708,798	73
South Coast	451,699,971	273,425,572	61
Central Coast	289,737,321	211,700,570	73
Sacramento Valley	270,160,823	193,465,893	72
Desert	199,624,147	90,716,701	45
a) Low Desert	(167,427,685)	(79,764,077)	(48)
b) High Desert	(32,196,462)	(10,952,624)	(34)
North Coast	98,251,974	28,237,860	29
Northeast Interior	22,352,292	9,679,565	43
Total	$2,256,890,682	1,477,935,659	72 (state av.)

* Excluding forest products. U.S. Bureau of the Census, *1954 Census of Agriculture*, Vol. I, Counties and State Economic Areas, Part 33 (Washington: Government Printing Office, 1956), pp. 68-70.

second only to the San Joaquin in over-all value of farm production, even though its cropland is but a third of that of the valley. The mild, but somewhat cooler, Central Coast has ideal conditions for deciduous tree crops, a specialty in which the area stands supreme. Its considerable fruit acreage enables it to rank third among the principal farming regions, and ahead of the Sacramento Valley. The valley has a two-to-one advantage in cropland, but its fruit area is smaller than along the coast. However, in this case it is not so much the insufficiency of heat that discourages extensive fruit raising in the valley as earlier fall rains and shallow soils.

If physical conditions and their effects on the regional pattern of farm income are best exemplified by crop distribution, then the influence of the California market on the income pattern is best shown by livestock distribution. The large and fast-growing population has already made the state deficient in meat, and promises to make it an importer of milk and other dairy products by 1975;[11] but it has also made the livestock industry a lucrative one in California. Although the income from livestock and livestock products is only half as great as crop revenue, it surpasses each of the major crop groups. All regions, except again the Northeast Interior, share in the prosperity. But in no region is the effect of urban demand as powerful as that of the Greater Los Angeles area on the South Coast and, to a smaller degree, the adjacent Desert. With almost 180 million dollars from the sale of livestock and livestock products in 1954, the South Coast led all other regions.

Subjected to both loss of agricultural land to urban use and to increased demands for the more basic food products, coastal southern California has been experiencing a major shift in agricultural emphasis, beginning as early as 1947. Since that time, income from livestock and livestock products has constantly exceeded that earned by the traditional specialty crops, particularly citrus. Livestock income is now 2½ times that of citrus in Los Angeles

[11] R. L. Simmons and R. G. Bressler, "California Dairy Industry, 1975," *California Agriculture*, 12 (November, 1958), 2.

County, with poultry income a third again as great as the traditional "World's Egg Basket" of the Petaluma area in Sonoma County; in Orange County, the heavy losses in citrus have been more than offset by the increased profits from dairy products and eggs; in San Bernardino County, the ratio of livestock income to the still major fruit crop is 2 to 1; in Riverside County, 3 to 2; and in San Diego County, practically 2 to 1.[12]

Without a doubt, the most concentrated livestock fattening center in California is in the Imperial Valley of the Low Desert. Other centers are the Antelope Valley of the High Desert and the small Palo Verde Valley on the Colorado River. All are dependent on the South Coast region for their market. The location of such a thriving industry in the driest area of North America emphasizes in still another way the economic force of the southern California market: in no other agriculture region, except perhaps the Northeast Interior, is the range so poor as on the South Coast and in the Desert; yet in no other region is the beef and dairy industry as productive.

When farming income is related to amount of cropland, we obtain a distribution of yield intensity, which again reflects the importance of good physical conditions and adjacency to local markets, but which in some ways is quite different from the distribution patterns of both cropland and farm production (Figs. 2 and 3). A common tendency in evaluating agricultural areas is to assume that the highest yield intensity is synonomous with the greatest production, particularly when comparing a large productive area with a small one. This error is often made when comparing such rich farming regions as the Corn Belt with the irrigated western oases.

The same mistake is frequently made in California. Despite its clearly superior leadership in cropland and farm income, the San Joaquin Valley is outranked by several of California's agricultural regions in yield intensity. (Table V). On the other hand, the Desert, whose cropland is a mere six per cent of the state total, and whose farm income is inferior to four of the seven state regions, leads all of them in yield intensity. Its intensity is almost twice the state average. Similar, but not quite as severe, changes in regional standing apply to the South Coast, which is the only close competitor of the Desert in yield intensity; and to the Sacramento Valley, which is saved from the bottom position in yield intensity only by the Northeast Interior. Only these last two regions have an intensity that is appreciably below the state average; the explanation for the regional variations in yield intensity lies, therefore, more in the advantages of the favored areas than in the drawbacks of the handicapped regions.

Near-tropical temperatures and a massive population combine to stimulate production intensity in southern California to far above anything achieved in the rest of the state. The almost complete restriction of such valuable, but also frost-sensitive, crops as lemons, oranges, and avocados to the warmer south enhances their demand and has encouraged heavy specialization. Thus while the San Joaquin Valley has twice as much fruit acreage as the South Coast region, the latter gets more of its farm income from fruit.[13] The emphasis on citrus has another advantage for the southland grower: its

[12] S. Hoos and E. M. Jones, "State's Agriculture Changing," *California Agriculture*, 12 (December, 1958), 2, 15-16, and U.S. Bureau of the Census, *1954 Census of Agriculture*, Vol. I, Counties and State Economic Areas, Part 33 (Washington: Government Printing Office, 1956), pp. 69-70.

[13] Shear, *op. cit.*, p. 3.

growth habit enables it to yield 25 per cent more per acre than the state average for noncitrus fruit. Practically all of the southern California fruit area is irrigated, so that yields of crops which are planted in larger acreages elsewhere are also higher in the south (e.g., irrigated vineyards vs. non-irrigated in the Central and North Coast regions).

Heavy national and local demands for vegetables have made it profitable to capitalize on the year-round warm temperatures through often intricate inter- and multiple cropping systems. Although the South Coast is the leading regional vegetable producer of California, the Desert (i.e., Imperial Valley) has long been known for its lucrative winter vegetable production. Both regions get many harvests, field crops as well as vegetables, from the same acreage. "Crop acres" are a third more than conventional acreage in the oases of the Low Desert.[14] Five crops are produced annually on the same acreage in some sections of the South Coast.

Production of livestock and livestock products for the large population of southern California contributes almost as much to the high intensity rating of the South Coast as crops. Their high value, already noted, makes up forty per cent of the region's total income. From the standpoint of both absolute value and proportion of income, the Desert can easily be considered the equal, if not the superior, of the South Coast in livestock intensity, for it is one of only two areas among regions of high yield intensity that gets more than half of its income from livestock—fifty-five per cent (Table II). If field crops are included—much of which is used for feed and forage—the proportion is an overwhelming eighty per cent.

High intensity in livestock production is also shown by the type of product. Heavy demand in California has forced the greater part of cattle production into milk and that of poultry production into eggs. But again, the regional emphasis is in the south. Los Angeles County in 1954 lead all others in the nation in "milk cows on farms," "whole milk sold," "value of dairy products sold," and "chicken eggs sold."[15]

The attraction of state markets can also be seen in the above-average yield intensities of the Central and North Coast regions. Both the Los Angeles and San Francisco urban areas are drawing a growing amount of fruits, vegetables, and dairy products from these two agricultural regions, although most of the first two groups still go to the East. By reason, also, of its mild winters and abundant rainfall, the North Coast derives more of its total farm income from livestock production than does any other region—seventy-one per cent.

Yield intensity drops sharply in the Sacramento Valley and the Northeast Interior. Because of poorer conditions for fruits and other specialty crops, most of the valley acreage is put into field crops. More than half of the land harvested is in the less profitable grain and grain hay. One of the most striking contrasts among the state's agricultural regions is that between the production intensities of the Northeast Interior and the Low Desert. While warmth and accessibility have helped make the Desert the most productively intensive region, cold and isolation have done exactly the opposite for the Northeast Interior.

[14] H. F. Gregor, "Evaluation of Oasis Agriculture," *Yearbook, Assoc. of Pac. Coast Geog.*, Vol. 21, 1959, p. 44.

[15] U.S. Bureau of the Census, *1954 Census of Agriculture*, Vol. III, Ranking Agricultural Counties, Part 2 (Washington: Government Printing Office, 1956), p. 1.

Capital Intensity. Production has its price, and in no area is this truer than in California. While the total farm production value of the state is greater than that of any other, its expenditures are also greater; outlays are almost double the total farm *income* of the next three most productive states, Iowa, Texas, and Illinois. This is another reason why knowledge of the distribution of capital intensity is just as vital as that of yield intensity in arriving at a regional pattern of over-all agricultural intensity. The calculation of capital intensity will be the same as for production intensity: first, a compilation of regional expenditures; then, their correlation with the amount of cropland.

Regional differences in capitalization are great, although the range is not quite as severe as in production value. Capitalization is also proportional enough to production value so that there is no difference between the regional rankings for capitalization and production. The San Joaquin Valley again dominates; the Northeast Interior trails. However, the three foremost expenditure areas lead the other regions much more clearly than they do in production income (Table III). Seventy-six per cent of agricultural outlays, those listed by 1954 Census, are in the San Joaquin Valley, the South Coast, and the Central Coast. It is no coincidence that eighty per cent of California's fruit acreage and about seventy-five per cent of its vegetable area are also in these three regions, for the raising of these two groups of crops is the most expensive of all farming economies.[16] Labor requirements, in particular, are heavy. Shear estimates that the fruit and nut industry, which uses only sixteen to seventeen per cent of the state cropland, employs more than forty per cent of all the farm labor used by the state.[17] The story is similar for vegetables. Poultry raising is next only to fruits and vegetables in farming costs, and this economy, it will be remembered, is especially prominent on the South Coast.

TABLE III

VALUE OF FARM EXPENDITURES*

San Joaquin Valley		$344,303,605
South Coast		219,874,336
Central Coast		183,698,699
Sacramento Valley		98,411,607
Desert		74,704,809
a) Low Desert	(62,805,164)	
b) High Desert	(11,899,445)	
North Coast		57,747,702
Northeast Interior		5,865,140
Total		$984,705,698

* U.S. Bureau of the Census, *1954 Census of Agriculture*, Vol. I, Counties and State Economic Areas, Part 33 (Washington: Government Printing Office, 1956), pp. 76-80.

Some significant gaps in the expenditure data offered by the Census would seem to alter very little the general distribution. In fact, omissions strengthen the leadership of the three most capital-intensive regions. As shown by a

[16] U.S. Bureau of the Census, *1954 Census of Agriculture*, Vol. III, Part 9, *op. cit.*, Table 44, p. 45.

[17] S. W. Shear, "Fruit and Nut Industry," *California and the Southwest*, ed. by C. M. Zierer (New York: John Wiley & Sons, Inc., 1956), 14, Part 2, P. 156.

national, but pilot, study made by the Census and the Bureau of Agricultural Economics in 1955,[18] only fifty to sixty per cent of the farmer's expenditures are regularly reported in the Agricultural Census.[19] The tallied portion of the total expenses drops even further when irrigation charges, a major expense item in California agriculture, are not included in either regular or special census studies. Yet irrigation costs and those of purchasing livestock and poultry, the other principal expenditure item not reported by the Census, make the capital-outlay totals of the San Joaquin Valley, South Coast, and Central Valley even more impressive. The South Coast and Desert, the latter with practically all of its cattle brought from elsewhere, would add particularly large amounts to their reported expenditures if information on livestock purchases were available.

But if regional differences in capital expenditures are large, they are still only relative. High capitalization is the story everywhere, no matter whether the farm is large or small, on good or poor land, or specializes in different crops. Investments in a wide range of machinery, in specialty crops, in wells, pumps, and related equipment, and in buildings boost the average value of California farms to amazingly high figures. For farms of several thousand acres, as in the San Joaquin Valley, values have generally been about $240,000; but irrigated farms of one hundred acres, or even a little less, often represent original investments of more than $100,000.[20] Land values for irrigated farmland in California are variable, but again, uniformly high. For fruits and vegetables, acre-values range from $1,150 to $5,000; field crops average $550 to $750.[21] Acre prices are much lower on unirrigated land, as low as $50 in some cases. But even when land prices are low and total land requirements modest, as for mountain ranches which use public lands, the total investment requirements are huge. An investment of $40,000 to $60,000 in land, buildings, and livestock is the minimum needed for a cattle business of one hundred head.[22]

Because farming operations are so mechanized, and since capital is completed labor, capital expenditures in California are also a good, although still incomplete, index of labor expenditures. The manual aspect of farm labor is represented in the Census only by a nonmonetary measurement, "man-equivalents of labor," and is applied only to farm types.[23] However, the fact that fruit-and-nut and vegetable farms also lead in this category[24] reemphasizes the regional distribution pattern of capital expenditures. Because of these agreements in distribution of capital and labor expenditures, we shall assume computations of capital intensity to be also reckonings of labor intensity.

---

[18] The sample study covered 6,600 farmers, and is useful primarily in showing the relative magnitude of various expenses of different farm types and sizes. U.S. Bureau of the Census, *1954 Census of Agriculture*, Vol. III, Part 9, *op. cit.*, p. 45.

[19] *Ibid.*, Table 49, p. 49.

[20] L. Haystead and G. C. Fite, *The Agricultural Regions of the United States* (Norman, Oklahoma: University of Oklahoma Press, 1955), pp. 258-59.

[21] "Land Values Up," *California Farm Reporter*, XIX (July, 1958) 5.

[22] A. Shultis, *Farming in California*, Univ. of Calif. and Calif. Agric. Exten. Ser., Circ. 173, 1951, p. 34.

[23] U.S. Bureau of the Census, *1954 Census of Agriculture*, Vol. III, Part 9, *op. cit.*, p. 31.

[24] *Ibid.*, Table 20.

The effects of urbanization and good physical conditions for agriculture are seen in the regional pattern of capital intensity as well as yield intensity. Contrasts between the patterns of farm expenditures and capital intensity (Fig. 2 and 3) are almost identical to those occurring between farm production and yield intensity: the coastal areas and the Desert improve their positions over those for expenditures, with capital intensities well above the state average; the San Joaquin Valley drops well behind to fifth position, with only average capital intensity; the Sacramento Valley joins the Northeast Interior with a mediocre intensity. However, the omission of certain basic expenditures in census reporting has had a more serious effect on the determination of capital intensity distribution than on the estimation of the location of yield intensities. As a result, the capital intensities determined for the leading regions are less accurate than those given for yield intensity (Table V). If one of the two critical statistical omissions, costs of livestock purchases, could be remedied, there is little doubt that the Desert and the South Coast would have a commanding lead in capital intensity as they do in yield intensity. Which of the two regions is superior to the other is impossible to determine with statistics now available.

The South Coast illustrates, perhaps more than any other area of the United States, the fact that high farming expenditures are a reaction to farming problems as well as farming opportunities. Capitalization is particularly high, not only because of good physical conditions and the huge market, but because the expansion of that market threatens to eventually eliminate farming in many areas. Wohletz and Dolder, as early as 1950, estimated that the urban area of the South Coast covered 700,000 acres,[25] or equal to about half of the region's cropland and not quite double the irrigated acreage. This large and growing urban area has materially boosted land values, taxes, labor costs, and water charges, often to the point where farmers can no longer compete with urban interests for the land. Southern California citrus growers, for example, pay four to five times as much taxes on an acre of land as those paid by Florida growers,[26] and wages of milkers in the dry-lot dairies are higher than the net income of most Wisconsin dairy farmers.[27] Thus the South Coast agriculturist is not only encouraged to increase his investments by the combination of a large market and good climatic and soil conditions; he is forced to do so in order to increase his production and thereby keep ahead of mounting costs. Increases in expenditures are, of course, made to increase farming efficiency as well as production, a topic we may now turn to in our final step of determining a distributional pattern of over-all agricultural intensity.

Gainful Intensity. Efficiency in a commercial agricultural economy aims toward the highest net return possible. Since we have already determined the intensity patterns of yield, capital, and labor, there remains to be discovered only the distribution of intensity of net returns before we may set up a regional pattern of agricultural intensity. Such a net-return, or *gainful*, intensity is theoretically a part of yield intensity. Geographically, however, it must be considered apart. As we will see, the distribution of gainful inten-

[25] Wohletz and Dolder, *op. cit.*, p. 36.

[26] Los Angeles County Chamber of Commerce, *1925-1954 Crop Acreage Trends for Los Angeles County and Southern California* (Los Angeles: Los Angeles County Board of Supervisors, 1955), p. 9.

[27] E. Higbee, *American Agriculture: Geography, Resources, Conservation* (New York: John Wiley & Sons, Inc., 1958), p. 274.

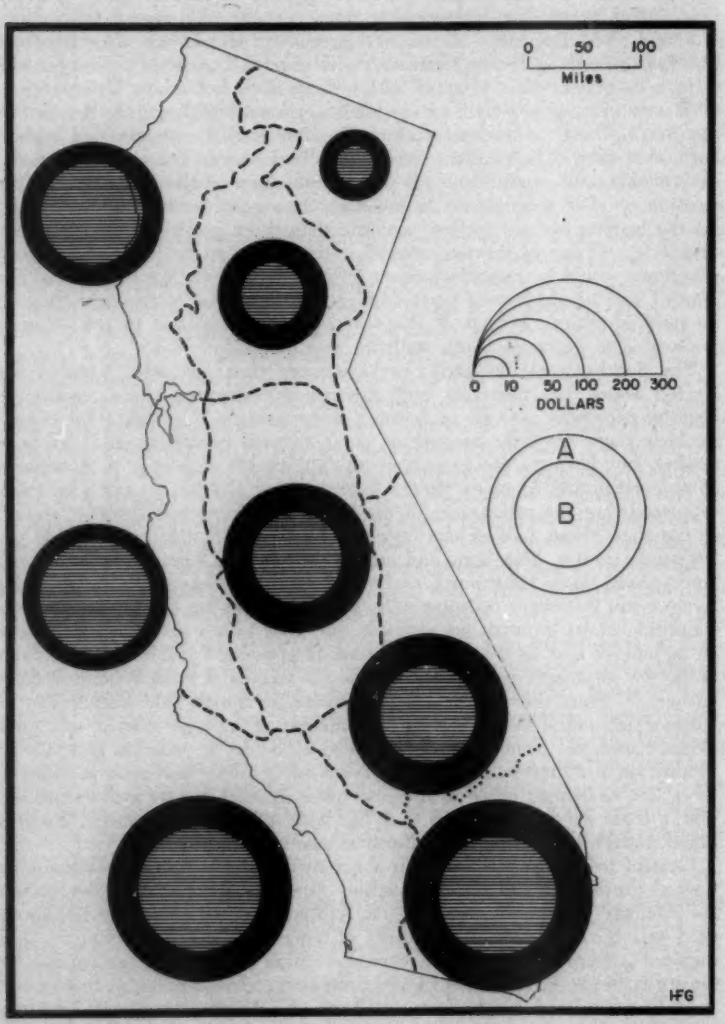


Fig. 3. Distribution of gainful intensity (A), capital intensity (B), and yield intensity (A + B).

sity does not necessarily have to be identical to the distribution of either yield or capital intensity.

Only one step, instead of two, is required for the determination of gainful intensity. Yield and capital intensities have already been computed, so that simple subtraction will produce the desired results. Still, a presentation of the distribution of the actual *value added* through the combined efforts of production and expenditures is appropriate; a comparison of value added with production value and expenditures, as well as with all intensities, shows important differences in all cases. The use of value added and gainful intensity is naturally qualified to some extent by the omission of certain items in farming expenditures, already mentioned.

Both familiar and unfamiliar regional rankings are evident in the distribution of value added. The San Joaquin Valley upholds its reputation as the richest agricultural region of California. Its leadership is greater, in fact, than in production value or farm expenditures, being more than two and one-half times that of the second place South Coast (Table IV). Together, these two regions produce two-thirds of the value added in the state, a proportion greater than that in the distribution of both production and expenditures. The North Coast and Northeast Interior also have their usual low slots. On the other hand, the Sacramento Valley ranks third, one position better than either its production or expenditure rank. The Desert, in fourth position, achieves the same feat. Compensating for these two improvements is the somewhat surprising decline of the Central Coast to fifth position.

TABLE IV

VALUE ADDED BY AGRICULTURE, 1954

San Joaquin Valley		$ 580,553,672
South Coast		231,825,635
Sacramento Valley		171,749,218
Desert		124,919,538
a) Low Desert	($104,622,521)	
b) High Desert	(20,297,017)	
Central Coast		106,058,622
North Coast		40,504,272
Northeast Interior		16,487,152
Total		$1,272,098,109

Regional differences in value added by agriculture cannot belittle the offering of any one area any more than they do in production value or farm expenditures. Many millions of dollars in net returns accrue to each of the major agricultural regions. Many examples of farming practices that contribute to highly profitable agriculture can be found almost everywhere, although emphasis naturally varies. Shultis believes that California, of all the states, has probably most of what is considered the greatest contribution to farming efficiency: number of horsepower—in tractors, trucks, motors, and engines.[28] The state also was second among all states in fertilizer expenditures in 1954. Multiple cropping is practiced in all regions except the short-season lands of the Northeast Interior, while inter-cropping is almost as common. Individual crops are capitalized several times over, through mul-

[28] Shultis, *op. cit.*, p. 7.

tiple harvests as from alfalfa or through several uses, as food, fodder, forage, and green manure from a stand of barley.

Areal specialization of crops is the most famed expression of farming efficiency in California from the geographic point of view, and much has already been written on the subject. Almost as well known are the factory-type methods of poultry raising and dairying, so typical on the margins of the heavily urbanized Bay Region and Los Angeles area. While the huge market is naturally, and correctly, given as the main reason for dry-lot dairies, and their location next to cities usually in defiance of poor feed and forage conditions, the actual economic adjustments involved in this kind of location are often not mentioned. This is the dairyman's way of meeting his expenses. Because of the high amount of labor input required, the value of milk is much higher than the feed which is given to the cow. It is, therefore, cheaper for the dairy operator to spend more time in caring for animals than raising their feed. Where the demand for milk is great enough, as in southern California, the importing of all feed, sometimes from a hundred or more miles away, often becomes a necessity. The consequent elimination of the land usually reserved for grazing and raising of feed crops also helps in two other ways: less exercise by the cow ensures greater milk and meat yields and less land means lower taxes in areas where land valuations are often governed more by mushrooming urban demands than by agricultural productivity.

The reverse of the problem of expense management is that of the "hog ranch" operator, who also locates in the environs of the two big urban centers. Here, the cost of feed rather than of labor must be especially considered. In this case, the operator capitalizes not only on the city as a market, but as a rich and dependable source of garbage, cull fruits, and waste from food processing—all cheaper than grain. The hog, of course, is even more suited, both physically and economically, to small land requirements than the cow.

Functional, as well as areal, specialization is still another means used to improve farming efficiency. Although inherent to areal specialization, the degree to which it is carried out by some of the farming economies in California is remarkable. One of the best examples of detailed division of labor is again that of dairying. In the Santa Clara Valley, in the Bay Area, there are at least three kinds of dairymen: the one who has nothing but cattle and grows no field crops of any kind; the one who has stock, grows all of his hay, and purchases only the grain feeds; and the operator who has no stock and grows nothing but alfalfa hay for sale. To these three types might be added another one which is especially common in the Los Angeles region: the cattle raiser who sells his heifers to the dry-lot operators. One might well think the ultimate in labor distribution has been reached with a more recent development in the South Coast dairy industry, that of the "heifer-fattening service," in which livestock raisers rent their calves to another for fattening before selling them to the dry lots.

Our examples of farming practices that emphasize high agricultural efficiency hint at what is strikingly corroborated in the regional pattern of gainful intensity: the overwhelming superiority of the milder and, in one case more populous, regions of the south—the South Coast and the Desert. Intensity in these two regions inflates the state average so much only one other area, the San Joaquin Valley can equal it (Table V). The inclusion of live-

stock purchase costs would undoubtedly reduce somewhat the enormous lead of these two regions, but there is likewise little doubt that the positions would be unchanged if the data were available. The differences between the distribution patterns of gainful intensity and value added are as striking as any of the previous comparisons of intensity and absolute-value distributions. The Desert moves from fourth to first position in value added in gainful intensity; the North Coast rises from sixth to fifth; in contrast are the San Joaquin Valley, which vacates first for third, and the Sacramento Valley, which drops severely from third to sixth; only the South Coast and Northeast Interior keep the same places, second and last, respectively. It will be noted, also, that in a comparison of gainful intensity distribution with that of the other two intensities, both the San Joaquin and North Coast improve their positions, while the Central Coast loses ground. However, because of the small differences in gainful intensity between these regions and the lack of complete data for its computation, too much conjecture on these changes appears unwarranted.

Certainly the extreme degree of gainful intensity in southern California cannot be attributed to farming practices peculiar to just that area; it is simply that they are emphasized so much more. Dry-lot dairies are not exclusive to southern California, or the state, or even the western hemisphere. They are common to many areas in Europe; in Hawaii, dry-lot farmers import feed from as far away as California and the Middle West.[29] No one would also deny that in degree of concentration and volume of production, the South Coast dry-lot dairy operations are easily the largest of their kind in California, if not the world. The South Coast also leads all other state regions in hog concentrations, although the total number is greater in the Sacramento and San Joaquin valleys. Similarly, the Desert's irrigated areas have only a small part of the state's beef cattle, but in no section is the feeder industry stressed as much as there. Yet, only three per cent of Low Desert cropland is used only for pasture—the smallest proportion of any agricultural area. Pasture is rotated with fodder and other crops. Again, alfalfa is grown in every county except San Francisco, but only in the Low Desert oases can as many as eleven cuttings be made a year. Besides doing more multiple cropping than any other region of the state, the farmers of the South Coast and Desert also lead in intercropping. Also, in a state which in 1954 was second only to North Carolina in expenditures for fertilizers, it was again the southern part that lead in intensity. Nowhere in California does the liquid fertilizer industry play such an important role as it does in the Low Desert, while as early as 1929 Los Angeles County was the leading fertilizer user in the West.

One final note may be made on the distribution of gainful intensity, as it is affected by the nature of the measuring instrument. It is obvious that by relating value added to the amount of cropland, we have obtained a distributional picture of efficiency in the use of *land*. However, while land use efficiency has always been of chief concern to the geographer and labor and capital efficiency to the agricultural economist, it is also obvious that all three kinds are necessary for a complete picture of gainful intensity. Methods and precedent for determining labor and capital efficiencies are not lacking. The Census Bureau has related value added to farm population so

[29] L. Durand, "The Dairy Industry of the Hawaiian Islands," *Economic Geography*, 35 (July, 1959), 238.

as to obtain a "value added per man-equivalent"; it has also divided the value added by the total investment in farm property in order to get the "value added per $1,000 of capital investment."[30] Hartshorne and a few other geographers have also shown the benefits of research into measurements of this type.[31] Time and certain computation problems prevent consideration of the distribution of these efficiencies in California, although census computations for farm types imply patterns roughly similar to that of land use efficiency. Based on 1954 statistics, fruit-and-nut and vegetable farms were the only commercial farms of eleven types to rank high in both labor and capital efficiency. Field crop farms were low in labor efficiency, but high in capital efficiency. Livestock farms were low in both categories.[32]

It should be noted, of course, that of all these methods for measuring agricultural intensity, only one, relating value added to capital investment, gives the fullest picture of agricultural efficiency. Efficiency is not necessarily synonomous with intensity, and the chances of any discrepancies being concealed vary with the constancy of the denominator being used. The quality of capital is more constant regionally than that of labor and certainly that of land. Value added as related to land is, therefore, just one measure of land use efficiency, just as it is only one measure of over-all farming efficiency.

Agricultural Intensity. And now, what of the over-all distribution of agricultural intensity in California? No more computation is needed to show that intensiveness centers on the South Coast and in the oases, with those of the Low Desert being outstanding. Following are the closely-bunched Central Coast, North Coast, and the San Joaquin Valley. They strike a medium between the leaders in the south and the Sacramento Valley and Northeast Interior of the north. Both of these latter regions are far behind the others in average intensity; however, the Northeast Interior also trails the Sacramento Valley by a good margin.

TABLE V

FARMING INTENSITIES, 1954

Region	*Yield*	*Capital*	*Gainful*
Desert	$282.00	$105.53	$176.47
a) Low Desert	(302.13)	(113.33)	(188.80)
b) High Desert	(208.10)	(77.00)	(131.10)
South Coast	266.56	129.75	136.81
Central Coast	174.38	110.55	62.83
San Joaquin Valley	173.69	64.66	109.03
North Coast	159.77	93.91	65.86
Sacramento Valley	93.83	34.18	59.65
Northeast Interior	39.55	10.38	29.17
State av.	$167.90	$ 73.22	$ 94.68

[30] U.S. Bureau of the Census, *1954 Census of Agriculture*, Vol. III, Part 9, *op. cit.*, p. 51.

[31] See, for example, R. Hartshorne, "Agricultural Lands in Proportion to Agricultural Population in the United States," *Geographical Review*, 29 (July, 1939), 488-92.

[32] U.S. Bureau of the Census, *1954 Census of Agriculture*, Vol. III, Part 9, *op. cit.*, Tables 52-53, p. 51.

Conclusion

Our attempt to outline the distribution of agricultural intensity in California, as noted before, is only tentative. Local variations in intensity are still to be considered; statistics are incomplete; problems of weighting various farming efficiencies seem hopelessly complex; cumulative error in computation is a constant threat. Perhaps the best justification for the study, with all its handicaps, lies in the spirit of Weaver's comments on the investigations of the elements of agricultural geography:

> . . . we undoubtedly lack many, indeed one might say most, of the basic data which we need to undertake the distributional description of our elements, if and when we succeed in isolating them. Nonetheless we cannot let this consideration deter us from seeking their identification, for if we do not have incisive understanding of what data we need, what hope have we of ever promoting their collection?[33]

[33] J. C. Weaver, "A Design for Research in the Geography of Agriculture," *The Professional Geographer*, X (January, 1958), 7.

THE CENTRAL BUSINESS DISTRICT CORE-FRAME CONCEPT AND SOME OF ITS IMPLICATIONS

RONALD R. BOYCE
Washington University

The definition of the central business district (CBD) has ranged from a broad, undifferentiated concept of "downtown," which might include everything colored red on a zoning map, to a tight retail core often referred to by appraisers and economists as the one hundred per cent district. Because of these varied popular meanings and usages, the problem of definition may never be completely resolved. Nevertheless, the central business district core-frame concept may contribute to a more sophisticated statement and understanding of the central portion of the city.

This concept was developed to provide a spatial framework in which to study the relationships between emerging freeway systems and central business districts.[1] As this concept was developed with a specific research objective in mind, many important meanings and interpretations of the concept were never presented. Therefore, the purpose of this paper is threefold: (1) to present the basic outline of the CBD core-frame concept, (2) to interpret it within the context of movement patterns, and (3) to present some implications of this framework with reference to freeway development, urban renewal programs, and city planning.

It has been widely demonstrated that land use patterns of cities are largely based on transportation considerations.[2] Therefore, it seems appropriate that a concept based on movement patterns should be developed. As the CBD core-frame concept causes the researcher to view the city within the context of nodal regions rather than uniform regions it provides a beneficial approach to the complicated spatial structure of American central business districts. Although the uniform region is an aid to analysis in physical geography, its use for urban analysis is limited, and in some cases, even detrimental.

It should be understood that the statements presented may not be valid for European cities, and certainly do not apply to cities located in the non-western world. They do represent a composite statement of patterns found in United States cities, and specifically refer to urban agglomerations of metropolitan significance.

Basic Premises of the CBD Core-frame Concept

In the CBD core-frame concept the central business district is defined to include the entire central and near-central portions of the city. For example,

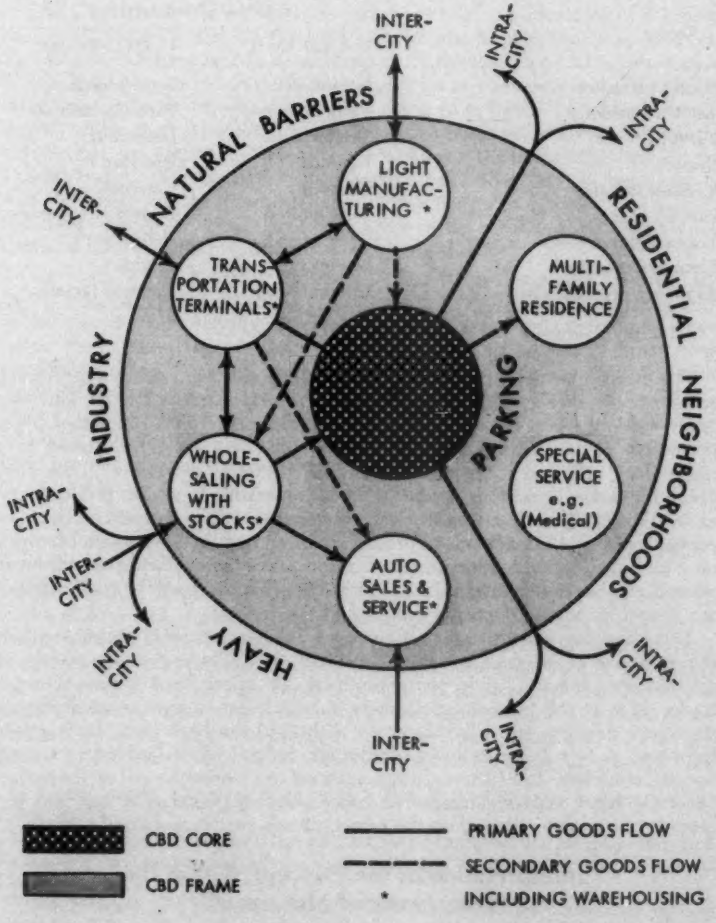
[1] Edgar M. Horwood and Ronald R. Boyce, *Studies of the Central Business District and Urban Freeway Development*, (Seattle: University of Washington Press, 1959) pp. 9-28.

[2] Alan M. Voorhees, Editor, "Land Use and Traffic Models: A Progress Report," *Journal of the American Institute of Planners*, XXV, No. 2 (May, 1959).

FIGURE 1

THE CBD CORE-FRAME CONCEPT

(SCHEMATIC)



in a city of 500,000 population it would include an area approximately ten square miles in size. This area is then broken down into distinct, yet functionally inter-related nodal regions termed the *CBD core* and *CBD frame*. The primary attributes and differences between these two areas are listed below in Table 1.

Table 1

PRIMARY DIFFERENCES BETWEEN CBD CORE AND CBD FRAME*

Factor	*Primary Characteristics*	
	In CBD Core	In CBD Frame
Land Utilization	Intensive	Semi-intensive
Site Utilization	Fully built on	Partially built on
Building types	Similar	Dissimilar
Growth	Upward	Outward
Business linkages	Internal	External
Parking space	Very limited	Generally adequate
Transportation mode	Pedestrian	Vehicular
Transportation foci	Intracity	Intercity
Boundary determinants	Internal factors	External factors

* Source: Horwood and Boyce, *op. cit.*, p. 22.

The functional activities in the central business district are represented schematically in Figure 1, along with the principal goods flows. This diagram has only very general geographical meaning. The functional areas presented as nodes in the frame for example, may be concentrated in a single area, diffused in several clusters, or partially dispersed. They may also be found in areas outside the CBD, but generally have less productivity, as well as different linkages in outlying locations. The interstices between concentrations of activity may contain a variety of functions, some of which may be linked to the nodes, such as consumer services catering to employed personnel. Natural barriers, heavy industry, and residential neighborhoods are shown as possible outer boundaries of the frame.

The foregoing generalization of the core linkage pattern does not preclude the existence of internal functional sub-foci also. These may be centers of government, finance, style, entertainment, or specialized types of retail trade. It is at the boundaries of these sub-foci that unique or anachronous structures develop, provided they can withstand the high rent. Such establishments as telephone exchange buildings, federal office buildings or court houses, churches, and fraternal organizations are common. All of these uses generally have limited linkages to other core establishments and are frequently the cause, rather than the effect, of sub-core boundaries.

Interpretation of the Concept Within the Framework of Movement

Introduction. Within the context of movement it is proper to consider the core and frame as distinct areas because of the nature of their circulation or linkage pattern and not because of the uniform characteristics previously

presented such as building height, land use intensity, daytime population, etc. Rannells has defined a linkage as "a relationship between establishments characterized by recurrent interactions which require movement of persons or of goods or the exchange of information."[3] Telephone and mail interactions are generally omitted because of their ubiquitous nature. The uniform area criteria as presented above are representations of the *effect* of circulation patterns and not the *cause*. Although such uniform criteria may well help point out to the layman the location and characteristics of the core and frame, they are incomplete statements regarding its nature, and thereby offer no real explanation.

The CBD core. The circulation pattern of the core necessitates a limited horizontal scale because of the walking distance implications and promotes an intensive vertical scale as represented by the elevator. The very nature of the linkage pattern, coupled with the historical underpinning of tremendous real estate investment, also causes the core to be well anchored despite drastic shifts in metropolitan population distribution.[4] In many ways the core exerts an alignment force very similar to the industrial belt of the United States.[5] For no matter how geometrically off-center the core may be with reference to the urbanized area population, it is almost certain to be the most easily accessible location in the entire metropolitan complex because of the focusing of transportation routes on it.

The core is held together and propagated by an internally complex and numerous system of linkages. For example, a typical large department store in the core is "commensally" linked to wholesale, warehousing, and transportation foci in the frame, and "competively" linked to other similar type establishments in the core. In addition, such an establishment also contains "complementary" linkages with various business services, and is "ancillarly" linked by its personnel to near-by cafes, barber shops, etc.[6] All of these different linkages are best viewed as spatial pulling forces which tend to keep the department store anchored.

The CBD frame. Contrary to the core linkage pattern, which is internally cohesive, activities in the frame are often linked to establishments in the core and in the rest of the city as well as in the frame. This linkage pattern is easily seen in the case of wholesale trade. (See Figure 1)

The physical implications and effects of this linkage pattern causes the frame to have the characteristics previously listed in Table 1. As the movements between establishments are primarily vehicular, most establishments have off-street parking and docking facilities. The areal size of the frame, for this same reason, is only limited by natural barriers and the presence of large residential areas which have strong internal linkages with schools and parking facilities. It is also limited by zoning and, of course, by the core itself. In addition, most frame activities are located on relatively flat land,

[3] John Rannells, *The Core of the City* (New York: Columbia University Press, 1956), p. 19.

[4] For an empirical confirmation of this see: Raymond E. Murphy and J. E. Vance, Jr., "A Comparative Study of Nine Central Business Districts," *Economic Geography*, XXX (October, 1954).

[5] See Edward L. Ullman, "Regional Development and the Geography of Concentration," *Proceedings of the Regional Science Association*, IV (1958), pp. 179-198.

[6] For further discussion of these linkage types see Rannells, *op. cit.*

and are critically dependent on access to the radial street system as aligned by the core.

Some Implications

The above interpretation of the CBD core-frame concept contains many immediate implications with reference to the evaluation of emerging freeway systems, urban renewal projects, and even city planning objectives in general. For example, urban freeway development is, in many respects, but another demonstration of the route alignment capabilities of the core. This is obvious by the fact that the dominant urban freeway pattern is composed of radials focusing on an inner-distributor loop around the core.[7] This system should strengthen the relationships of the core to its surrounding hinterland by diminishing the costs of transportation. It is therefore probable that new office and specialized retail functions which require intra-city centrality will develop and that many other activities such as retail trade which can operate on a semi-city hinterland will continue to decentralize throughout the metropolitan area.

In another regard, the freeway system and its inner-distributor loop in particular may interfere with central business district linkage patterns. Most authorities warn against dissecting similar type land use with freeways because of the possibility of severing cluster linkages.[8] Consequently, the inner-distributor loop is generally located between the core and the frame.[9] Of equally pressing concern, however, is the danger of separating dissimilar types of closely-linked land use from each other. This is one of the more serious objections to placing the inner-distributor loop in its present planned position. Undoubtedly, this loop will cause serious transfer obstacles to occur between the core and the frame if interchanges are not planned to avoid it.

Urban renewal is a deliberate and large scale attempt to change the central business district by means of erecting multi-story apartments in what appear to be "slummy" portions of the frame. While the social value of such projects is commendable, the measurements required to qualify for urban renewal are based solely in terms of uniform area criteria which have no basis in terms of linkages. While it is true that high density residential structures are common in the frame, too little is yet known about the spatial structure of the central portion of the city to determine what particular use should be made of such large areas of available land. It logically follows that the results of such projects in terms of the rest of the city are largely unknown.

It should be pointed out, since it is particularly applicable to demands for urban renewal, that many of the nodal clusters in the frame have a very undesirable appearance because of their characteristic mixed land use patterns.

---

[7] For further discussion see: Edgar M. Horwood and Ronald R. Boyce, "The Nature of Urban Freeway Systems," *Highway Research Board*, Research Bulletin No. 230, and *Academy of Sciences-National Research Council*, Publication No. 690, pp. 85-99.

[8] For a discussion and substantiation of this principle see: Max S. Wehrly, "Spacing and Location of Interchanges on Freeways in Urban and Suburban Areas," *Urban Land*, XVII, No. 9 (1958), pp. 3-5.

[9] Horwood and Boyce, Studies of the Central Business District and Urban Freeway Development, *op. cit.*, pp. 106-111.

Nevertheless, their linkage patterns are strikingly orderly and are vitally connected to the operational efficiency of the entire urban area.

Most city planning criteria, as evidenced by "master plans" and zoning restrictions, are also based on uniform rather than nodal concepts of land use. Their guiding principles appear to be that the many types of land use should be physically separated in large blocks, and that the city should look and function as much like the country as possible. While many of their plans appear sound, little consideration is consciously being given to the alternative juxtopositions of land use and their over-all effects. The practicability of such plans with reference to the interaction requirements of the various types of land use is being only partially considered.

Conclusions

It seems clear that further research on the city within the context of this paper is imperative. This is demonstrated not only by the increasing proportion of people living in urban environments, but also by the increase in such large scale public measures as freeway development, urban renewal, and city planning schemes. Nowhere outside of the Soviet Union has man tried to control and change so much of his physical urban enviroment so fast, and the consequences of these schemes are not understood. The general attitude is that the city is congested, infested with slums, abusive of land use because of haphazard growth, and that planning and deliberate public action are immediately necessary. This argument is difficult to deny, but it would be far more reassuring if the city and its functional interrelationships were better understood, or even considered, in such actions. There is a real probability that the major so-called improvements and controls which are now becoming so widespread may prove to be some of the most detrimental aspects of city growth since the Middle Ages.

CULTURAL LANDSCAPES OF PORTUGUESE INDIA*

DAVID SOPHER
Sacramento State College

The existence on the Indian subcontinent of three parcels of land which have long been under Portuguese dominion provides data of particular value in the study of the shaping of landscapes by culture. By discovering to what extent landscapes, in this case in the Portuguese territories of India, have become different as a concomitant of evolution in a special political-cultural situation, we will be able to look further at the processes of interaction between culture and habitat. That a "unique personality" is expressed in the landscape of Portuguese India, particularly of Goa, has become a cliché of geographical literature, making the area an especially promising vehicle for an investigation of this type.

Portuguese India consists of three small, widely separated territories on the west coast of the subcontinent: Goa, with an area of roughly 1400 square miles on the Konkan coast some 250 miles south of Bombay; Damao, about forty square miles in area, on the Gujerat coast north of Bombay; and Diu, a minute holding, eight miles long and a mile wide, off the Kathiawar coast. The total population is 600,000. Damao here will refer only to the coastal portion of the territory having that name; part of it, the interior enclave of Nagar Aveli, having come, *de facto*, under Indian control in 1954.

A comparison of the three territories provides a striking illustration of diversity in cultural landscapes—the kind of diversity that is the keynote of the cultural geography of India. The landscapes of Damao and Diu, at least, are patently Indian in almost all respects. The slight impression of Portuguese cultural forms on people and land is clear, although there are, in fact, some conspicuous products of Portuguese construction: the fortresses, the walls and gates around the towns of Damao Grande and Diu, a few baroque churches—but of the three in Diu, two are falling into ruin—some streets in Damao that are lined with houses in the Portuguese style, to be described later for Goa. These, and some dispersed government installations, appear as alien culture forms superposed discordantly on the prevailing indigenous base. Christians are a small minority, many being actually Goans, and knowledge of Portuguese is extremely limited.

Cultural Geography of Goa

In describing the interesting cultural geography of these two territories, Goa must receive more attention. The territory of Goa corresponds roughly to an embayment in the 3,000-foot scarp front of the Western Ghats, the

* Field work on which this paper is based was carried out in Portuguese India during the summer of 1959, and was incidental to a study of Indian strand communities done under contract to Office of Naval Research.

main mountain mass being here recessed some 25 miles inland from the coast. The low land between the Ghats wall and the sea, interrupted in part by granitic outliers, consists of two contrasting land forms. Areas of flat alluvial fill make up less than half of the total; the larger part is in roughly horizontal platforms at varying elevations, commonly between 100 and 250 feet above sea level, everywhere mantled with a crust of laterite, tens of feet thick. These platforms do not usually have backslopes, but appear as low, wide mesas, dropping off on all sides into intersecting linear depressions, which, though partly filled with alluvium, accommodate streams with fairly deep channels.

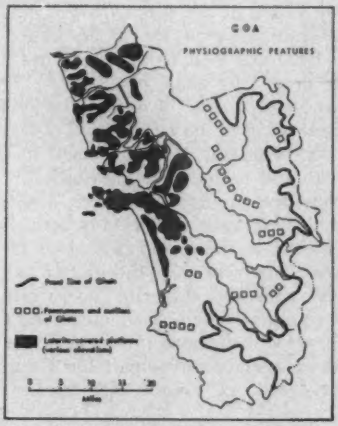


Fig. 1. Physical Features of Goa

This is, for example, the character of Ilhas ("the islands"), the central part of the territory where the site of Old Goa is located. The islands are *not* deltaic, but isolated low blocks, sporadically bordered by an alluvial flat. The fragmentation has the effect of keeping the two different surface forms, alluvial plain and raised laterite platform, in close proximity, so that they constitute, as a rule, two well-differentiated parts of a single areal unit of agrarian economy, rather than forming the basis of two contrasting economic modes pursued by separate, and hence distinct, populations. Almost all the large towns of Goa have sites at the immediate foot of these mesas, with houses straggling up the less precipitous slopes, and often with spacious structures of an institutional character situated on the higher level, dominating the skyline.

This is what gives a dramatically stark appearance to the ruins of Old Goa, rising above the coconut groves and untended fruit gardens at its base. It is also the pattern of the present capital, Pangim, a few miles downstream on the Mandovi River. The town is but a few blocks wide at the river level; beyond, the Igreza Madriz and the Seminario give a facade to the laterite-encrusted slope. To the sides of these, the ascent is steeper, but each foothold has been occupied by the dwelling, with yard and banana patch, of some working-class family, chiefly Hindu. Above is the Archbishop's Palace

and the recently built quarters of the officers and families of the garrison forces.

The laterite surfaces of the platforms are usually, however, of desolate appearance. Despite the 80 to 100 inches of monsoon rain, the present vegetation is an open brush cover, of large-leafed bushy growth primarily, and some scattered small trees, chiefly planted cashew nut, alternating with bare patches of blackened laterite, which may support, during the monsoon, a thin mantle of grass. Almost all of the upland area is traversed by low stone walls which divide the land into roughly rectangular plots, 25 to 50 acres in size, for, in addition to other economic activities—the quarrying of laterite, the grazing of cattle during the monsoon, and the harvesting of cashew nuts—some cultivation of dry cereals and vegetables does take place sporadically on the laterite; however, by far the larger part of the enclosed land remains untilled from one year to the next, and in many places cultivation seems to have been long since abandoned. The hypothesis is advanced that there was an expansion of agriculture during Goa's heyday; a decline thereafter, accelerating in the later period of emigration and importation of cheap food, but beginning to be reversed in the present phase of rapid population growth and partial trade blockade.

Goa is, par excellence, the country of laterite. The blackened, pitted surface of weathered laterite blocks is seen everywhere: in property walls, nowhere more strikingly than in the abandoned acres of Old Goa; in the retaining walls of terraces; and, wherever the plaster has peeled, in the walls of houses, temples and churches. Laterite blocks are used in many rural houses, and in all the upper-income urban houses and commercial buildings of Western style. They were the material used in the grand structures of Old Goa, some of which remain functional: the Cathedral, the Church of Bom Jesus, housing the relic of Francis Xavier, and the Arsenal, now a barracks.

The alluvial lands are given over very largely to paddy rice. Except for an occasional isolated farmstead or small cluster of houses among the fields, they are empty of habitation, the larger villages, with coconut orchards and fruit trees, hugging the skirt of the laterite platforms or occupying the higher surfaces of the plain itself. Here, too, in association with Christian villages, are the churches, conspicuous by reason of their imposing, brilliantly whitewashed baroque facades. Many small villages irregularly and loosely agglomerated, or linear, depending on site characteristics, constitute the pattern of rural settlement, the houses always separate, each with its own yard. As an exception, on the sandy littoral plains of Bardez and Salcete there is a dispersed, though dense, arrangement of single houses set back at varying distances from the road, interspersed with quarter- and half-acre plots of coconut palms. There is here little to mark the passage from one village area to another.

The standard house type has a single-storied rectangular plan and a raised ground floor, with steps going up to the front veranda; the roof is usually a simple gabled one. A two-storied square house with double roof and a veranda on three sides is sometimes seen in the more conservative Hindu areas. It is in the Christian villages, especially in Bardez, that most departures from the standard type are seen, together with large windows, cornices, two-toned plaster wash and flat roofs—modifications that derive from both Portuguese and contemporary Indian sources. In a few towns—Ribandar, on the road from Pangim to Old Goa, and in the Fontainhas section of Pangim

in particular—Portuguese urban architectural influence is conspicuous. Walls are built directly on the street and are finished in yellow, blue, or wine with broad white bands framing windows and doors; the windows, with shutters, are topped by a semi-circular section; there are balconies at the upper level, with a balustrade of grillwork. In the older houses, the translucent shell of the window-pane oyster is used artistically; on the basis of its distribution in Goa, it is possible that this is a Portuguese introduction from Malacca.

New Conquests

A closer look at the distribution of specific features of Portuguese derivation indicates that they are far from universal though sporadically conspicuous. A primary distinction exists between the *Velhas Conquistas* (Old Conquests) and the larger but less populous *Novas Conquistas* (New Conquests) which surround the former and were not acquired by Portugal until the mid-eighteenth century. The New Conquests (the term is now, understandably, in official disfavor) show little trace of the Portuguese presence. In urban architecture, for instance, or in the use of Portuguese in shop signs and, except for the town of Ponda, there is no place that has a cohesive community of Christian Goans.

Fig. 2. New Conquests

The area in the New Conquests immediately bordering the Old is dotted with Hindu temples, some of considerable size, almost all being the homes of local gods transferred in the sixteenth century from the Old Conquests to escape constant harassment there. These temples show unmistakably the influence of Catholic church architecture. In two other respects, however, there is little evidence of this kind of diffusion: rural house types are largely unaffected by the variety of modes seen in Bardez and Salcete, and there has been little interstitial penetration of Catholic ideas into the beliefs and practices of Hinduism. Paradoxically, it is in Portuguese India that Hinduism retains its full vigor and in an ultra-conservative form. Having been isolated from the currents of rationalistic thought permeating India under the British, some of the more lurid of Hindu practices, as judged by Westerners, are still quite at home in Goa.

It should be noted that the extension of Portuguese territory to the Ghats front was the product of a relatively late *Geopolitik*. For more two hundred years, the navigable waterways and lines extending from them sufficed as boundaries. Neither of these rationales applies to the southern portion of the present territory: Canacona is an isolated pocket of lowland cut off from the north by the granite mass of Quepem, an outlier which is only slightly removed from the main line of the Ghats.

Old Conquests

In the Old Conquests, the Christian core of Goa, Hindu cultural elements abound today, although the paucity of temples is a sharp contrast to the abundance of churches. Because of heavy *Christian* emigration during the past seventy-five years, chiefly to India, Christians today comprise only forty per cent of Goa's population, although still in a majority within the Old Conquests. Equally numerous and often occurring side by side are Christian glimpsed through open doorways, and Hindu symbols such as the *tulsi*, the sprig of sweet basil on its pedestal set in front of every Hindu house, and prints depicting Hindu deities hung in the homes. Demonstrating the economic importance of the Hindu population, such pictures of Hindu gods, garlanded with jasmine and marigold, are to be seen in most of the taxis and symbols such as the *cruzeiros*, or stone crosses, and religious pictures buses in Goa, in the great majority of retail shops, in virtually all the large import houses, and in offices of the leading mine owners. Banking and insurance are government monopolies, but Hindus dominate the commercial life of Goa. It is almost exclusively Hindu capital, with some foreign partnership, that is involved in the production of iron ore, currently amounting to 3 million tons a year.

Although Hindus in the Old Conquests show a marked urban or small town concentration (there is no modern counterpart to the city of Old Goa), there are a number of Hindu villages in the area, and some points of difference between the rural populations of the two communities may be noted, apart from those already mentioned.

1. *Agricultural economy.* A major distinction here is not in cattle raising, for the village Christians do not as a rule eat much beef, but in the keeping of pigs in large numbers by Christians, and not by Hindus. *Sorobidela*, a Portuguese savory of pig's blood and giblets, is a favorite Goan dish. The keeping of poultry is also, but much less markedly, associated with Christian villages. A minor distinction is that the cultivation of areca or betel-nut palms is a Hindu monopoly, virtually all the groves being found in the New Conquests, often in association with temples. In the *technology* of agriculture, and also of fishing, there is no discernible difference between the two groups.

2. *Mobility and its consequences.* The heavy emigration of Christians has relieved population pressure on the land, but has also meant a loss of initiative and managerial interest in agriculture. One gained an impression of neglect in certain Christian areas, for instance in the coconut groves in Bardez and, in some cases, such commercial agricultural operations have been taken over in the Old Conquests by Hindus. This contrasts with the diversity of cultivation around Hindu villages and with other indications of greater care expended by Hindu cultivators, who have been less mobile.

3. *Social organization.* The church provides a focus for village social life which the Hindu temple does not, and Christian village women participate

more freely in public activities than do Hindu women. Christian communities thus have in the church an institution which could conceivably have a vital role in the diffusion of technological and other knowledge as it has in the past, for example, in the spread of literacy in Konkani, the local language written in the Roman alphabet, and in the musical education of what is today an almost rabidly music-loving population.

4. *Living standards.* There is more of a middle-class gentry among the Christians, with a higher level of conspicuous consumption in housing, clothing, and diet (including the consumption of alcoholic beverages). Better opportunities for government employment and, especially, remittances from emigrants, make this possible. Another factor which should be noted is the contrast between the would-be fidalgo attitudes of the Goan landowner and what appears to him as the galling frugality of the Indian, who may invest a considerable part of his surplus in treasure.

These observations can now be related in a broad culture-historical scheme. There are elements of a "Portuguese landscape" in Goa, primarily resulting from an early cultural dynamism in which the Church was much involved, a process which has since slowed down considerably. The resultant landscape is *not* unique; a combination of similar elements can be seen on the west coast of Ceylon, extending some forty miles north of Colombo. As in Goa, most of the original population there was converted to Catholicism in the sixteenth century, and most of them have Portuguese names, although the Portuguese power endured for scarcely a century.

A second phase expressed in the landscape of Goa has been a degree of isolation from developments elsewhere, even in India, until recently. There is marked retention of traditional forms, particularly among the Hindu population.

Trend Toward Indianization

The third phase is still in operation. It is a sort of "Indianization" of Goa, in which the main current of culture change comes from modern India through the Christian Goan community. Of the emigrants to India, large numbers have always returned, either temporarily or permanently. Most of them come from Bardez, which some Goans refer to as "a suburb of Bombay" because of the large number of returned emigrants who speak English and have a more sophisticated world view than that of most metropolitan Portuguese living in Goa. The dynamics of culture change foreshadows the increasing movement of ideas from India to Goa, but the process has been interrupted as a result of the Indian action on the border in 1954-55 and the subsequent Indian economic blockade. As a consequence, some noteworthy features of Goa today are the thousands of Portuguese and African troops in the area, suggesting a state of siege, the strict press censorship with the exclusion of Indian newspapers, the absence of political discussion, in striking contrast to India; and, also in contrast to India, the dead hand of government in the matter of economic development together with the heavy influx of foreign manufactures because of Goa's status as a free port. The process of Indianization has been retarded, and the Portuguese intention of actively resisting it further is symbolized by their conversion of the local currency from rupees to *escudos*, the currency used in Portugal. But when one can travel in Goa in a taxi equipped with a short-wave radio set tuned at high volume to Radio Bombay and the latest in Indian news and Indian culture, it is apparent that Indianization is still in process.

AREAL POLITICAL STRUCTURE AND ITS INFLUENCE ON URBAN PATTERNS

JAMES E. VANCE, JR.
University of California, Berkeley

Study of the geographical nature of the city has been particularly concerned with the forces shaping urban patterns of functional division, density of settlement, and morphological development. By those whose work has been morphological in nature these patterns have been related especially to terrain and historical development. By those viewing the city as a functioning entity greatest stress has been laid on the economic forces at work in the city. By neither group has any systematic consideration been given to the part that larger political patterns play in shaping the city. It might be anticipated that the political geographer would evince interest in how areal political patterns bear upon the city, but this has not been the case. That there is a "political geography" of the city is strongly demonstrated by a number of studies of individual cities. Nelson's work on Vernon, California,[1] clearly shows the contribution of local political conditions in the growth of a part of the city. Attention has been given to the influence of state and national boundaries on urban clusters but perhaps the most basic aspect of urban political geography, the nature and form of local civil divisions, has been overlooked by both urban and political geographers.

We as geographers are fully aware of the part which land sub-division in rural areas has played in the creation of a distinctive agricultural settlement pattern. A contrast is often made between areas of metes and bounds surveying and of the Congressional Land Survey, but in the case of cities we have tended to work at only the lowest level of partition. Stanislowski brought to our attention the importance of the rectalinear block in shaping the city[2] and Dickinson,[3] Leighly,[4] and Taylor[5] have all turned at times to the influence of inherited town plans. But in no case has the second level of land division, the minor civil division, been considered. It is suggested that this second level has, if anything, a more pervasive influence on the functional and physical development of the city than the first level, as within the

---

[1] Nelson, Howard J., "The Vernon Area, California—A Study of the Political Factor in Urban Geography," *Annals of Assoc. of Amer. Geog.*, Vol 42 [1952], pp. 177-191.

[2] Stanislawski, Dan, "Origin and Spread of the Grid-Pattern Town," *Geog. Rev.*, Vol. 36 [1946], pp. 105-120.

[3] Dickinson, Robert E., *The West European City: A Geographical Interpretation.* London: Routledge & Kegan Paul, Ltd., 1951.

[4] Leighly, John B., "The Towns of Mälardalem in Sweden: A Study in Urban Morphology," *Univ. of Cal. Publications in Geography*, Vol. III, No. 1 [1928-1930]. Berkeley, 1931, pp. 1-135.

[5] Taylor, Griffith, *Urban Geography.* London: Methuen and Co., Ltd., 1949, particularly Ch. VIII.

minor civil division we find the smallest repository of independent political initiative.

The Minor Civil Division

Any discussion of areal political structure is concerned with an heirarchy of civil division. Historically, we may distinguish among systems of administration and control; monarchy and republic, federation and unitary government. But in every case there must be an organization of ultimate sovereignty with non-formal contractual responsibility to a higher level of government. Today this would be the "nation state" but in the past it might well have been the "city state," the "free city," or some other non-national unit. If ultimate sovereignty reposes with the nation-state, this sovereignty is seldom exercised entirely by any central administration. The very size of any nation-state militates against total central administration. To accomplish the ordering of government for a large area, even in an authoritarian state, it is necessary to delegate responsibility, and usually initiative, to subsumed administrative units. The nature of these lesser units has great meaning in the growth of the city.

In the United States the federal form of government organically introduced the two levels of government at the top, the nation and the subdivision of the nation which became our state. But even in the antecedent Colonial times all colonies proved too large to be governed from a central point so that a more localized civil division was required. In general the local administration fell to two geographical and administrative forms brought from England, the municipality and the county. The city and parish served respectively urban and rural areas for most intimate administration. Although in some cases wards and precincts were found, these were essentially no more than electoral divisions of a place either areally or demographically too large to be canvassed as a unit. The county was originally an intermediate form between the municipality and the kingdom in England, and when introduced into America it was intermediate between the municipality and the colony. Its function was largely the adjustment of local economic contrasts through the support of shared institutions such as prisons, poorhouses, and local roads in common. In the case of administration the county could serve as a convenient delegate of legal functions. The county officers were officers of the colony in the carrying out of legal adjudication, but in other forms of administration they held powers specifically delegated by the colony to care for the combined interest of municipalities. The municipality, although having similarly specific powers delegated by the colonial legislature, enjoyed much greater breadth of action and local initiative. Perhaps most important of the fields of activity normally granted to the municipality was in the provision of municipal services and the caring for the health, safety, and general welfare of the citizens. Under this mandate to care for public welfare most of the discretionary functions we now associate with the city were authorized.

In terms of the hierarchy of governments the two geographically local forms may be thought of as minor civil divisions. The municipality and the county were defined in area just as much as in authority and throughout American history they have represented the most obvious and most contrasting aspect of governmental division of geographical area. In both the history of civil division and its contrasting forms at present we encounter a subject of great importance in any discussion of American urban geography.

Initial American Political Areas

The original political structure within the United States was no doubt aboriginal. But for us this heritage is slight. Even in those areas, the Mississippi valley and the Southwest, where by extension we might speak of "urban Indians," the inundation by Anglo-Saxon political structure has been nearly complete. Thus we must turn to the early English colonies to find municipal beginnings; this initial stage is best represented in Massachusetts, whose state constitution of 1780 predates all other similar documents, both state and national. In this document specific roles are assigned to political-areal units. Three levels of government and associated areas were modelled closely on the Anglo-Saxon precedent: (1) the ultimate sovereign, which in 1780 was the Commonwealth of Massachusetts; (2) the regional subdivision, the county, with delegated powers of administration of basically state functions, and (3) the repository of most intimate control, the municipality. Historically and structurally the municipality and county were equals. Each received its powers from the state in the form of a charter and each was held accountable to that state. The functions of the two differed, as did their areal extent, and in no way was the county considered the basic unit of government. In fact in Massachusetts, Norfolk County was created in 1793 long after the municipalities which comprised it.[6] The two were equally competent administrative forms operating in differing sectors of government and thus not functionally competitive.

The historical background of this division of function may be found in the nature of the original settlement. Massachusetts was ecclesiastical in its political geography up to 1828 when the state church was abolished. The meeting house served as both the religious and governmental center, a situation quite logical under a conventional state religion. The group meeting there had an identity in geographical terms as the parish was coterminous in general with the civil municipality. This identity sprang from an early Colonial statute requiring all citizens to live within one-half mile of a meeting house and allowing new settlement only around a new meeting house. The absence of local government was unthinkable just as the absence of orthodoxy was not allowed. What we have come to call "home rule" was the right of all whether rural or urban, and the exercise of this right required the establishment of an areal political structure which parcelled all of the state among the municipalities. The town of Wayland shortly after settlement in 1639 was the earliest and largest of the inland towns, but otherwise it serves well to point up the nature of political division and attendant settlement.

It was within this framework of ever-ready municipalities that urbanism developed in the nineteenth century. Although the political boundaries of the municipalities—called cities if obviously urban and chartered as such, and towns if more rural and still governed by the "Town Meeting" in its Meeting House—did not limit the urban development, they did remain as political divides. Functionally the city spread but once outside the boundary there was a new political focus. This persistent political structure has been noted by Harris as a major cause of the numerous discrete suburbs in New Eng-

[6] Commonwealth of Massachusetts, Frederic W. Cook, Secretary of the Commonwealth, *Historical Data Relating To Counties, Cities And Towns in Massachusetts*, Boston, 1948, p. 7.

land.[7] In some cases what is now the "suburb" pre-dated the city. In only one case, Boston, was there any appreciable annexation of territory to the central municipality and even there the amount was small by comparison with most American cities. San Francisco bemoans its small size but it is only 1.5 square miles smaller than Boston today. This absence of annexation is easily explained by recalling that the basic status of all municipalities, city or town, was the same with no more than a contrast in their governing body. All could tax and be taxed, sue and be sued, and provide for their protection, order, education, and welfare.

Local control had much to do with the shaping of settlement. The towns surrounding the city reproduced in microcosm the core with commerce and industry giving economic support for an equal status. The basic-non-basic analysis of the economist could have been applied to all and would have shown that most municipalities enjoyed the primary support of industry or farming. Throughout New England the mill village was well developed and widespread in occurrence to the extent that we still think of this area as one of ubiquitous urbanism rather than predominant industrial towns. Even today a catalogue of the places which produce the bulk of hardware, textile machinery, machine tools, plastics, and a number of other products would mean little to anyone unfamiliar with New England towns. The important fact is that the growth of the central city urbanized the surrounding countryside but did not engulf it politically. The existence of competent and responsive local governments in the zone of city growth permitted a metamorphosis from the rural administration of Colonial times to the suburban administration of present times. Under these conditions of localized government the functions undertaken by that government have proven unusually responsive to changed economic support.

The Development of the American County

Along the Atlantic coast two rather contrasting structures developed: that in the North with town or cities serving as the basic units of political division, and that in the Chesapeake Bay area with counties and cities parallel in status one with the other. In Maryland and Virginia the main variation from the New England pattern was to be seen. There the county emerged as a government of rural areas rather than a subsumed part of state government. School administration and the provision of "municipal services" became in large measure a county function. In Virginia the land was divided into counties, but on attaining urban stature places were separated from the county and given equal and parallel standing as administrative sub-divisions of the state. Although less completely the case in Maryland, Baltimore, after its incorporation as a city in 1797, became independent of the county. Thus if we look today for cities outside of any county all are in Virginia and Maryland with the exception of St. Louis, whose structure may well have sprung from these Middle Atlantic antecedents. And the county in the Middle Atlantic states was proportioned for its function. From the quartile breakdown of states on the basis of average size of counties[8] it is apparent

[7] Harris, Chauncy D., "Suburbs," *Amer. Journal of Sociology*, Vol. XLIX [1943], pp. 1-13.

[8] These quartiles are for a 48-state United States. States ranked by average size of counties. First quartile of 12 states—212 to 549 square miles. Second quartile of 12 states—565 to 706 square miles. Third quartile of 12 states—762 to 1126 square miles. Fourth quartile of 12 states—1650 to 8113 square miles.

that the small county, as represented by the first quartile of average size, shows a remarkable concentration in the Middle Atlantic area. New England, with the exception of Rhode Island where county geographical divisions exist but no county governments have been organized, stands in the second quartile (Massachusetts, Connecticut, and Vermont), the third quartile (New Hampshire) and even the fourth quartile (with the largest counties) in the instance of Maine. The evidence seems clear that the small county capable of providing the full range of governmental services was not an element of New England political structure. It is interesting that Maine is the only state east of the Rockies in the fourth quartile. The settlement of inland Maine in the nineteenth century was accomplished in an area similar to western U.S. with respect to extensive economic activity but, unlike the West, the municipality was the basic governmental unit, organized where people lived, and unorganized in timber areas. "Towns" were the form in fully settled areas, "plantations" on the settlement frontier, and simple survey townships beyond the frontier. The county remained a unit charged with regional rather than local concerns.

As settlement was projected into Kentucky and Tennessee and later into Ohio and the Prairie states, we have evidence of the mixing of the New England and Middle Atlantic patterns. Ohio, Indiana, Illinois, Iowa, and Nebraska had town-like forms, in this case called townships. These were more than land sub-divisions, having a range of administrative functions and various governing bodies. At the same time, the small county was carried westward as shown by the presence of Ohio, Indiana, Illinois, Kentucky, and Tennessee in this lowest quartile.

Geographically intermediate between New England and the Chesapeake Bay area New York, New Jersey, and Pennsylvania were also transitional in political structure. They had chartered minor civil divisions, called townships in New Jersey and Pennsylvania. These units collectively contained all the area of the states but a variation existed in the sense that within the townships nucleated settlements were often set apart as boroughs, villages, or cities depending on size and function much as the cities of Virginia were set off from the county. The result was that these three states came to have three layers of government below the state—the county, and broadly spread townships, and the pinpointed boroughs, villages and cities. South of the Mason-Dixon line the areally inclusive township was little used. North and South Carolina (with the exception of four counties in South Carolina) were divided into county sub-divisions known as townships but these were no more than land divisions except in the case of two, Sullivan Island and Folly Island townships in Charleston county, where civil administrative functions were granted but with the strange proviso that three of the five town commission members be appointed by the governor on the nomination of the Charleston county legislative delegation. This pattern has fortunately remained idiographic. Thus we may say that the strong town with its own assigned area not subject to separation and additional incorporation was a peculiarly New England phenomenon, one which even the 1957 Census of Governments appears to misinterpret.[9]

[9] In the 1957 Census of Governments (Vol. 1, No. 3) it is stated that "A municipality, for purposes of Census statistics, is a political subdivision of a State within which a municipal corporation has been established to provide general local government for a specific population concentration in a defined area." (p. 2). Despite this definition the Census classifies only the 37 cities of Massachusetts, the 33 cities

West of the Appalachians the new states were sub-divided largely in keeping with the traditions of their settlers. Kentucky, Tennessee, Alabama, and Mississippi had counties and no townships despite the fact that the latter two were divided under the Congressional land survey. At the same time, Ohio and the states of the Old Northwest were consistently divided into townships. The townships were moderately strong in function in Ohio, Indiana, Illinois, Michigan, and Wisconsin at the time of founding but slowly they have lost civil functions beyond road maintenance and tax assessment in all but Wisconsin. There the New England town concept took root and has flourished with only cities sharing the local political responsibility. Ohio townships have lost virtually all functions, Illinois townships have little left, and Iowa townships have been abolished as anything but county sub-divisions. West of the Missouri the progress of townships was halting. In the patchwork of civil townships in the Dakotas there were many areas having nothing but townships serving as land-description units. Where the civil township exists in the more fortunately endowed section of the eastern Dakotas and the Williston Basin, these units have only minor administrative powers, largely road maintenance. In Nebraska the attempt to carry local governmental units beyond the Hundredth Meridian was unavailing and only 27 of 94 counties have organized townships. In Kansas the township was carried to the western boundary and organized, but only for very minor road building functions now relinquished in many counties. In Oklahoma townships were organized at the time of settlement but in 1933 they became a victim of the drought and have lost all functions. In Missouri the areas of "Northern" settlement show up as sections of weak township government with the marked exception of the cotton-raising Bootheel which shares with South Carolina the distinction of having the only functioning townships in the South. Elsewhere in Missouri the units are solely for land description, as is also the case in Arkansas.

The pattern of townships west of the Rockies mirrors early settlement. The mining areas of western Montana with their sustaining valleys were divided into townships in name but not in function. This is also true of a small area in northeastern Idaho close to the early mines. Elsewhere, California and Nevada, with the exception of two counties (Alpine and Mono) in the former and one (Esmeralda) in the latter, were parcelled into survey townships but no functions were given these units and they have subsequently lost any significance except in legal description. In Washington two small areas have road-building townships.

In summary it seems obvious that the township proved nontransferable as a form of actual administration with broad powers. Wisconsin adopted this form but other areas which started along the course have ultimately turned to the county or the pinpointed city as the areal political structure for local government.

---

and boroughs of Connecticut, the 12 cities of New Hampshire, and the 7 cities of Rhode Island as municipalities. This total of 89 "municipalities" compares with 86 "municipalities" in Wyoming, demonstrating the absurdity of the classification. In virtually all cases the New England "town" meets all of the qualifications set up for a "municipality." They are legal corporations, they have higher destinies of population in many cases than "cities" elsewhere, and they are legally defined as to area and carry out more extensive general government than in most other states (they provide for schools, police, fire, other municipal services, and very often court functions).

The Emergent County

The progress of the county was far different. The small Middle Atlantic county was well developed in the Transappalachian area to the west. The pattern of county size shows a rather uniform increase as the settlement fabric becomes less dense west of the Mississippi and in the Great Plains. In essence it seems that the county grew larger with later settlement, reflecting extensive agriculture or widely scattered mining settlement in the Mountain and Far West. In terms of political areal structure the westward expansion of political division removed the functioning township and the westward expansion also increased the average size of counties. These points will be seen to have great importance in the subsequent growth of cities in California.

Western Configuration

In considering the development of areal political structure in California we may with reason pass over the Plains and Mountain states and the structure found there. The Oregon Country and California were peopled from the Middle West and somewhat before the intervening country. The areal concepts applied to the organization of California in 1850 lead back almost directly to the Prairies. The first legislature was faced with the problem of providing some sort of political sub-division for a rapidly growing and economically turbulent area. In this context it is not surprising that in 1850 the state was divided into 27 counties, of which 23 were north of the northern boundary of San Luis Obispo-Kern-San Bernadino counties as presently drawn. In the period 1850-1893 the northern counties increased in number from 23 to the present 48. During the same period the counties to the south of the line mentioned increased from four to nine. The last of the current 58 counties, Imperial, was created in 1907. Of the 48 in the north all but five were organized within the first fifteen years of statehood. Two were added in the '70's and three in the '90's. It is obvious that the land in the economically important north was rather quickly parcelled into counties which undertook the administration of the area. This areal political form was suited to the urgent need to secure some form of government in a region of constant flux. In the Gold Fields thirteen counties were organized and it is eloquent testimony to the ephemeral nature of settlements to record that the area has had collectively 32 different county seats of which only 12 ever lasted long enough as cities to become incorporated. Even outside of the Gold Fields municipal organization was unusual. As the land was surveyed judicial townships were delimited but in 1875 there were fewer cities in the legal sense than counties, 48 cities and 54 counties.[10] Most of the cities were in the coastal agricultural valleys surrounding the Bay area, in the redwood area, or scattered widely in the mining area and in southern California. Obviously the county was the significant areal political unit.

The pace of city building quickened in the last quarter of the century. Sixty-three municipalities were incorporated and in two typical locales: in the valleys of southern California and in the Central Valley where most of the present trading centers achieved city status during this period. A few additional lumbering towns were also added.

The "boom" in the establishment of municipal corporations occurred between the turn of the century and the First World War. In fifteen years one

[10] Dates of incorporation of California cities are from *The California Roster*, 1959.

hundred twelve cities were established, one more than during the first fifty years of state history. These cities were most concentrated in the Los Angeles Basin, in the Imperial Valley, at the foot of the Sierra Nevada, and in the suburban sections of the Bay Area. From this period stem the earliest suburbs in the San Francisco and Los Angeles area. And this decade and a half witnessed the solid establishment of the politically fragmented nature of the Los Angeles conurbation. By 1915 there were forty-five separate municipal corporations in the Basin.

During the First World War and the 'Twenties incorporation was highly clustered. One-half the new cities were in Los Angeles and the remainder of the forty-eight were primarily in the San Joaquin Valley or on the San Francisco peninsula. With minor exceptions the desire for city establishment elsewhere in the state seems to have disappeared. Instead the special purpose district fluorished, affording the opportunity to provide desired municipal service without the expense of incorporation. In 1927 land use planning was authorized by the legislature and it is significant that counties as well as cities were empowered to undertake this activity. The fifteen years, 1930-1945, produced few cities and these mostly during the Second World War and in non-urban areas. Of the eleven for the period no more than three were in urban areas. We may note that at the end of that war there was little use made of the extremely lenient powers of city incorporation. California in 1945 had fifty fewer municipal corporations than Massachusetts[11] and already three in the Gold Fields have become inoperative if not legally extinguished. One is led to the conclusion that in the twenty years before 1945 there was a striking reversal of the trend toward the creation of cities. This reversal was not the result of population stagnation but rather, it seems, of a return to the concept of the county as the logical agent of administration even in urban areas. County powers were enhanced along with county activities and great use was made of special districts to the extent that in the 1957 Census of Governments California ranked first by far in the number of special districts established to provide urban services. It had 421 districts, or 23 per cent of all such districts in the United States, and nearly twice as many as second-ranking Illinois. With the cessation of significant numbers of municipal incorporations, the assumption by the county of urban functions, the creation of numerous special districts, and the continuing disuse of the surveyed judicial township, California in 1945 represented a striking example of the predominance of the rural-strong-county transported to the western limit of American settlement.

Post-War Changes

During the first five years after the war no more than seventeen cities were incorporated and, of these, only three were in metropolitan areas. The remainder were largely trading places in the agricultural area of the state. The rapid growth of urban population in the late 'forties took place within the existing cities or in the unincorported "county land" around them. But around 1950 this pattern of political organization in urban areas was radically changed and in the nine years through 1958, 53 municipal corporations were established of which 37 were in the San Francisco or greater Los Angeles metropolitan regions. Thus, the present decade has witnessed a

[11] Both towns and cities are here classed as municipalities in Massachusetts for the reasons cited in Note 9. In California both also are used but there this usage conforms to Census practice.

rapid increase in the number of incorporations to the point that the current rate approaches that of the boom in the earliest part of this century. Perhaps even more meaningful for us is the fact that 80 per cent of the incorporations have been in the five largest metropolitan areas of the state.

This marked change in the history of city formation, with its seeming rejection of the idea of the urban-serving county government, has taken place when that government, in general, has been more than ever able to care for urban needs with professional county administrators, extensive planning facilities, numerous service districts and agencies, and the absence of any pressure for incorporation to secure adequate school construction. It would seem that a trend in civil division that we have followed in company with western settlement has been reversed and this reversal has to be analyzed.

Previously it has been noted that the enhancement of county powers has arisen from two characteristics of settlement strengthened in westward expansion. (1) Western settlement was dominantly rural even though contemporaneous with the American Industrial Revolution, and (2) this settlement was highly individual and politically unorthodox. It is worth remembering that in Utah, where the covenant within the group was strong, municipal organization of land was undertaken to the extent that that state today leads all others in the percentage of its population living in what the Census defines as municipalities. Elsewhere, rural economy and individual settlement rather consistently led to a dependence on the county as the basic civil division. This fact is supported in the negative in the case of highly urban and industrial Connecticut which abolished county government during the 1959 legislative session.

The initial political subdivision of California was established for a dominantly rural and individualistic population and the county was dominant. After an experiment with municipal organization early in this century, main reliance for the government of later settlement was returned to the county. This return did not succeed because there was a mixed system of strong counties and cities with extensive powers of annexation. Much as the emphasis on the county may have returned, the annexation laws passed during the municipal boom of the early 1900's were not repealed. These laws allowed cities to annex land virtually at will so long as it was uninhabited county land (Uninhabited Annexation Law of 1911), or in odd pieces where inhabited. The proliferation of special purpose districts plus the blandishments of expansionist cities made possible the winning of an annexation election in many areas so long as they were carefully delimited to exclude those in opposition. To a considerable degree, the downfall of the county as the dominant civil division was the traitor in its own domain. In areas distant from existing cities, even though densely settled, there has been a continuing reluctance to seek full municipal status and a tendency to rely on county services. The three most commonly stated reasons given by areas seeking incorporation are all negative: most frequently to avoid annexation, next, in order to abolish an unworkable multiplicity of special purpose districts, and finally to secure local control of zoning due to a desire to restrict severely the permissable land uses.[12]

[12] The cause of city incorporation in California was studied by the California Assembly Interim Committee on Municipal and County Government which reported in the Transcript of Proceedings for meetings at Martinez (June 6, 1958), San Jose (August 8, 1958, and Los Angeles (July 22, 1958) the three "causes for incorporation" here summarized.

A striking example of the negative intent of some recent municipal incorporations in California has been the creation of a number of single purpose cities in which only a single land use is permitted. Hillsborough (1910) and San Marino (1913) pioneered the entirely residential city in the two major metropolitan areas, but they have been followed recently by Monte Sereno (1957) and others. Rolling Hills (1957) carried this to the ultimate by incorporating an area without either public streets or public access. Woodside, Fremont, and several other cities have stated as their purpose in becoming municipalities the desire to avoid "becoming cities." Currently in Alameda County there is a proposal to incorporate all but four square miles of the remaining unincorporated area of the county into a single rural city which would out-distance Los Angeles in size by some forty per cent. Emeryville (1896) began the development of cities restrictively industrial but its boundaries were carelessly drawn and it now has 3,000 people. Vernon (1905) was far more successful as Howard Nelson has shown. After fifty years it has a population of no more than 417. Recently the City of Industry has joined this group. In the realm of commercial development the examples are less striking but they do exist. San Bruno (1914) became a protected reserve for the "sporting element" unwilling to be reformed in San Francisco and, surprisingly, a similar reserve developed in Emeryville in relation to Oakland.

In a discussion of urban political geography in California it is impossible to ignore the topic of the competitive nature of recent annexation as the body of county land subject to the law of capture may well be shared among several cities. We have noted the tendency to incorporate as a defense against involuntary inclusion in an existing city. This has resulted in a low average size of cities. Over half the cities in California are under three square miles in area, and some are as small as a fifth of a square mile. But in addition to this consequence of annexation, the extension of tongues of city land has become extreme. The Santa Clara Valley has been the site of the most notable example of proruption defying description; startling as this pattern of city boundaries is, its importance for us is the implied vacuum these extensions attempt to fill. The absence of local areal division at the time of settlement has proved a costly experiment and may well account in considerable measure for the unique areal chaos of metropolitan California. To a very marked degree the headlong expansion has resulted in the "repeal of the laws of land economics." Land does not progress from the lower to the higher use by virtue of locational advantage, but rather by virtue of political design and the possibility of annexation. The availability of municipal services may be far more a matter of political attitudes and the presence of virgin, that is to say county, land than of any consistent land use plan or the operation of locational advantage. Islands of agricultural land within the city and islands of city land in the country have led to a too rapid ripening of land from agricultural to urban uses. And like too-fast ripening in other organisms, the artificially matured city is course textured and tasteless, highly susceptible to economic and functional decay. These are some of the implications of areal political structure for the urban geographer.

CATTLE-FEEDING IN THE IMPERIAL VALLEY

ROBERT A. KENNELLY
Long Beach State College

During the past two decades a new emphasis in beef production has developed in western United States—that of feedlot operations. With nearly 10 per cent of the entire nation's cattle-feeding business, California leads all other western states; furthermore, this activity is highly concentrated in the Imperial Valley which now averages one-fourth of all cattle on feed in the state.

Imperial Valley is the generally accepted term for the southeastern portion of the California desert, formerly called Salton Basin. During the past half century, with the help of Colorado River water, this below-sea-level area of several thousand square miles has been converted from wasteland to highly productive agricultural land. The gentle surface, deep alluvial soils, year-round growing season, and plentiful water supply, together with generous applications of capital and technical skill, have made this one of the outstanding agricultural areas of the West.

Historically, cattle production in the Imperial Valley may be divided into two major periods. During the first, which extended from about 1910 to 1940, irrigated pasturage was the basis of a significant beef industry, which reached a level of approximately one hundred thousand head annually in various years prior to 1940. Emphasis on feedlot operations began in 1940 but, with the advent of World War II, production actually declined until 1944. The feedlot emphasis became marked about 1950, and is largely responsible for a tripling of output during the past decade. A little pasturing is still done, but at present more than 85 per cent of the cattle are on full-feed programs, and those on winter pasture or summer sugar beet residue are usually put into the feedlots later for finishing. The growth trend is graphically illustrated in Fig. 1.

The Imperial Valley now has more than 150 feedlots, of which about 115 are actively in operation. These range in capacity from one hundred head to more than 20,000 head, being capable of accommodating a total of approximately 300,000 cattle simultaneously. Although the majority of the lots can take less than one thousand head, the mean size of active lots is about 2,500. The bulk of the business, however, is done by a score or so of large lots capable of handling more than 3,500 head at a time.

Feedlot Types

Feedlots have been traditionally classified into five types, but only two are really significant in the Imperial Valley. The first of these is the commercial feedlot, which probably accounts for more than one-half of the feeding activities. This is essentially a custom business in which cattle are fattened

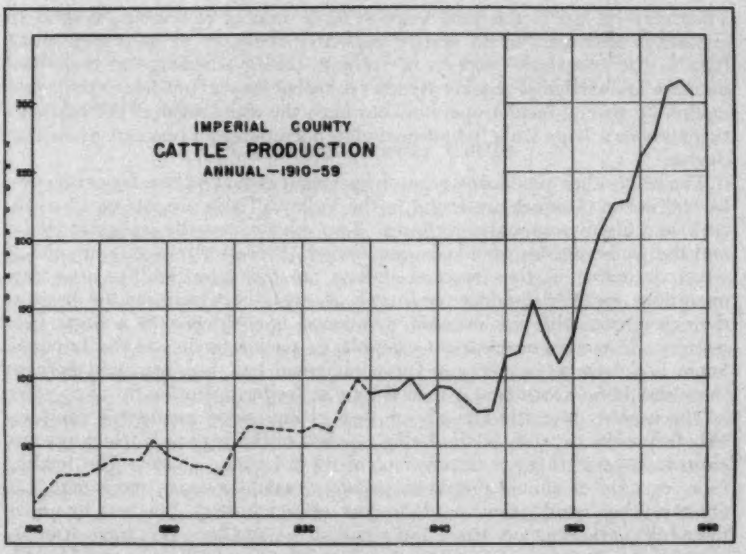


Fig. 1. ***Sources*****: Prior to 1930, varied unofficial and semi-official reports; after 1930, Imperial County Board of Trade, El Centro.**

on contract terms for anyone desiring that service. The commercial lot earns its income from the sale of feeds, services, and space, and does not assume any market risk as a necessary part of the operation.

The owners of the animals in commercial lots range from large operators who devote full time to managing their cattle interests and whose main economic functions are management, financing, and risk-taking, to middlemen with recognized market outlets for meat animals, and down to small-scale amateur operators carrying on speculation as a sideline. In general, the relationship between a commercial feedlot and the owner is informal, and the terms of their agreement quite standardized. The owner depends entirely upon the feedlot for the details of animal care, and takes no active part in this phase. Such care is one of the recognized services of the feedlot —the service upon which its reputation is based. In some cases, but by no means generally, the owner's dependence upon the feedlot operator extends even to buying and selling decisions. In a few cases, the owners dictate the details of the handling of their stock; few commercial lots, and then only the smaller ones, will accept such contracts, since special care for certain lots of animals is not consistent with the mass-production aspects of their operations.

The second most important type of operation is that of the owner-feeder, who operates his own lot for his own cattle, but purchases his feed supplies. Such private operations include some of the largest feedlots in the valley, and account for most of the production outside the commercial yards.

There is considerable overlap of these two major types of feeders, since most commercial operators manage some cattle on their own account or participate regularly in temporary partnership with some of their customers.

They may engage in this joint venture for a number of reasons, such as to encourage customers to fill unused capacity, or simply to participate more fully in the speculative aspects of feeding, taking advantage of their own intimate knowledge of market trends. A recent minor, but interesting, promotion by several feedlot operators has been the encouragement of and participation in a large-scale, investment-club operation as a business promotion device.

The only other significant type of operation is that of the farmer-feeder, several dozen of which are found in the Valley. These are almost all small-scale and highly seasonal enterprises. Two other types, the processor-feeder and the packer-feeder, should be mentioned. Processor-feeders, only one of which is active in the Imperial Valley, are characterized by large-scale operations using by-product feed, such as sugar beet pulp, as the basis of their programs; the one instance mentioned is a sideline to a sugar beet refinery. There are no clear-cut examples of packer-feeders in the Imperial. Some Los Angeles packers use the commercial lots, however, and perhaps these should be considered a special type of feeder operation.

The number of cattle actually on feed at any given moment is considerably below the capacity of the Valley. A few of the big yards which operate close to capacity have a turnover of about 2.4 times a year. The feeding ratio, or ratio of annual output to capacity, would average more than 2.0. On the other hand, many yards do not attract enough business to utilize their full services at any time, and some of the smaller yards have strongly seasonal or intermittent operations, while others are idle for considerable periods between shipments of stock. Recent increases in capacity have been primarily in expansion of the larger yards.

Both feed crops and by-products are used in the feeding programs. The principal corps are alfalfa, hay, and barley, which together are grown on a quarter million acres of Valley land. Milo, a sorghum grown for grain, and hegari, a sorghum used for silage, are comparatively small but significant feed crops. These are supplemented very heavily by the by-product feeds derived primarily from sugar beets and cotton seed.

Until recently, the Imperial Valley was essentially self sufficient in feeds except for minor supplies of certain by-products. As feeding has expanded in volume, however, the area no longer produces enough for its needs. Recently, quantities of milo from Texas and Oklahoma have been regularly shipped in, primarily by railroad. During the past year, corn and, to some extent, prepared feeds based upon corn have been coming in from Mexico, supplementing the by-product cottonseed feeds that have long been imported from the Mexicali area. No data are available on the volume of these imports, but local sources state that these represent significant and necessary additions to the Valley supply.

The programs utilizing these feeds, especially in the larger lots, are carefully planned and controlled, and detailed standardized records are kept for analysis and future readjustment. A typical operation would involve pens holding forty head of 500- to 900-pound steers; 600-pound animals are close to the ideal. During a 120- to 150-day feeding season the animals will add from 200 to 450 pounds. Calves and cows, as well as very light or very heavy animals, are put on quite different regimens.

In the larger lots, all possible phases of the operation from feed handling to pen cleaning are as mechanized as possible to minimize labor costs. The smaller lots cannot afford the necessary capital for such power equipment,

so their net production costs are generally higher. A good example of the high-capital, low-labor orientation is found at the Holly Sugar Company feedlot, where eight full-time, semiskilled employees, in addition to the manager and office staff, operate a 5,000-head lot. Larger lots have an even more favorable labor ratio.

Sources of Feeder Cattle

Feeder cattle, mostly calves and yearlings, are obtained entirely from outside the Imperial Valley and almost entirely from outside California. As might be expected, the western ranch states are the big suppliers. Texas is the most important source, shipping some one-hundred thousand head to this area in 1959, with Arizona contributing nearly half as many. Large shipments are brought in from other range states as well and, in any given year, cattle will have come at one time or another from almost every western state. Very recently, with a general shortage of feeder cattle on the market, there has developed a surprisingly large influx from the southern states. Mississippi, Florida, Louisiana, and Alabama have all contributed feeders to Imperial Valley lots, incomplete data indicating that more than one-tenth of the Valley stock in 1959 came from these states. In addition, in recent years Mexican cattle have been arriving at the rate of several thousand a month, providing stiff competition for United States ranchers.

There is a noticeable seasonality in areas and in quality of supply. Shipments come in strongly from the northern states in the fall, while the southern states market more heavily for summer feeding. A smaller proportion of high quality animals is received from the South.

Cattle reach Imperial Valley feedlots through several channels. Many large operators buy directly from the ranching areas, maintaining close contact with various regions, and having their own buyers in the field at all times. Commission men arrange for an important part of the supply, working directly between the rancher and Valley feedlots or through out-of-state auctions. The remainder—perhaps one-seventh of the total—is handled through an auction yard at El Centro, which solicits consignments from all over the feeder-supply area. This is a particularly important source of cattle for the small-scale feeder who cannot afford the more elaborate buying arrangements, and whose individual importance in the market is not great enough to assure him of a dependable and economical supply of animals through commission channels.

Direct From Ranch to Feedlot

Transportation is still predominantly by rail, but has been shifting rapidly to trucks and, despite the well-known cheaper rail rates, trucks compete profitably over surprisingly great distances, especially with animals small enough to be handled by double-deck rigs. Although the truck rate is usually higher than the rail rate, the lower terminal costs, lack of transhipment, lower incidence of injuries, lower incidence of disease following shipments, absence of extra charges, and fewer delays in transit all help to make the truck competitive and give it preference in the Valley. The proportion of southwestern cattle reaching the Imperial by truck is, of course, greater than the proportion for any of the other supply areas. As an example of comparative rates, it costs about $1.50/cwt. by truck from Abilene to El Centro, compared to a rail rate of $1.32/cwt., plus extras for care.

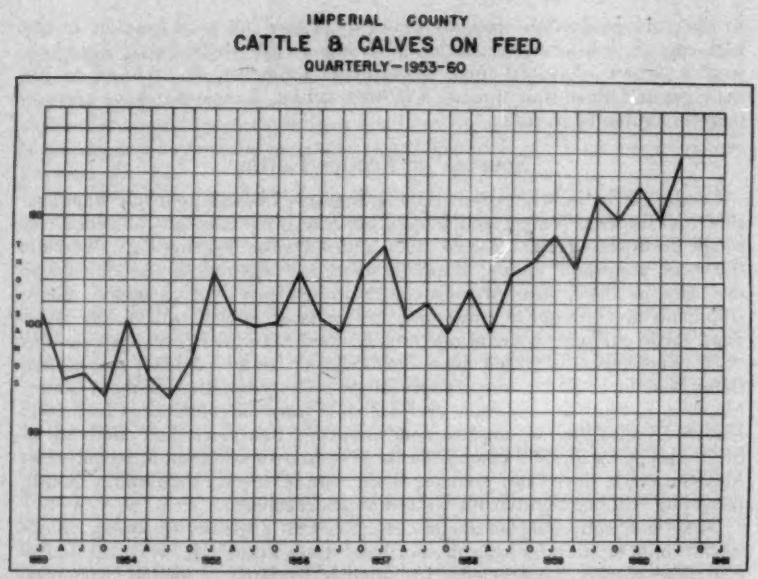


Fig. 2. *Sources:* **U.S. Dept. of Agriculture, California Crop and Livestock Reporting Service, Sacramento, *California Annual Livestock Report.***

The market for finished cattle is principally in the Los Angeles area, to which the fattened animals are trucked for slaughter after having been purchased at the feedlots by the packers. A significant secondary market, approximately one-sixth of the total, is the San Diego area, where five packers depend in part upon Imperial Valley output. Only one packing plant of modest capacity is located directly in the feeding area.

About one-half of the animals marketed fall into the Low to Average Choice grades, with probably less than 15 per cent being fed up to High Choice. This purportedly reflects the market demand rather than a limitation imposed by available stock, feeds, or feeding techniques. About one-fourth of the output would grade as Good, and 10 per cent as Standard or lower. Since Prime beef has a very narrow market in Southern California, it is not of significance in Valley operations. As far as stock and feeds are concerned, it is claimed that this grade could be produced in greater quantities. The Los Angeles demand is for rather lean beef, and the market will not pay enough of a premium for Prime to warrant the better bred animals, longer fattening time, and greater amounts of feed needed for its production.

In addition to the pronounced upward trend of production evident in Fig. 1, which is based upon annual data, certain seasonal trends in Imperial Valley feeding may be seen in Fig. 2, based upon quarterly data on cattle and calves on feed. In general, winter feeding operations are heavier than those of other seasons as shown in the pattern for 1953 through 1957. The amount of seasonal change varies markedly in these years, ranging from 5

per cent to 90 per cent higher in winter than in summer. In 1958 and 1959, however, the summer minimum is obscure; it is observable only by comparing the summer with the *succeeding* winter. As the over-all growth trend is not significantly different during these two periods, this more recent statistical pattern cannot be explained simply in terms of exceptionally great increases in capacity.

With the extreme summer climate of the Imperial Valley (91° July av., 120° plus maxima), a reduction in feeding activity with the onset of hot weather would seem natural and necessary, and this has been the commonly given reason for the former low summer feeding levels. However, the increase in summer activity in recent years constitutes recognition that this extreme climate is not an absolute limitation on feeding programs. Summer feeding capacity was formerly limited to the shaded feedlot area. As this is not excessively expensive to provide, summer operations have been expanded, especially by the larger lots, making the industry more intensive and less seasonal. Summer operations are not significantly different in other respects from those of other seasons.

There remains a persistent drop in feedlot operations in the late winter and early spring, as shown in Fig. 2, in which the April data are invariably below those of January. Further study shows that this pattern has long been common to all of California's feeding, and is not necessarily accounted for by conditions unique to the Imperial Valley. The reason is that California markets for beef in spring and early summer are served to a significant extent by cattle coming from the winter and spring ranges, and to a much lesser degree by cattle pen-fed at this season. In anticipation of this supply, feeders generally make lighter commitments for marketing at this time.

Orientation to the Market

The orientation of the national cattle industry has long been associated mainly with areas of superior feed production. In the West, however, orientation appears to be to markets for meat, and expansion has been related to population and income trends. This is a reasonable, and perhaps even obvious, orientation in any case which involves a large isolated market having sufficient variety of demand to absorb all of the products and by-products of the industry. It then becomes a matter of physical possibilities—whether or not the requisite feeds and animals can be obtained somewhere near the market, as they can be in this instance. Competition with the older, established beef-producing areas is reduced to the extent of the additional freight costs of several cents a pound that would be incurred in serving western markets from these distant meat supplies. The Imperial Valley or other western feeding areas could afford to be "inefficient" to the extent of these extra freight costs and, in view of the history of the industry here, this advantage must be sufficient to permit cattle feeding to operate profitably.

Within this primary orientation, the industry necessarily seeks the best available feed resources, and there is strong intra-regional competition between various districts in California and Arizona. The Imperial Valley, with its smooth terrain, adequate water, and year-round growing season, is a leader among the California feeding areas. However, these conditions are nearly duplicated in a number of places, leaving no area with any great innate advantage. Capital investment, the organization of feeding, marketing, and packing, and the techniques of feed production and feeding must

be kept up to date in any area if it is to remain in a competitive position. As long as the Imperial Valley had adequate feed-producing capacity, the industry could and did expand in response to strong western market demand, and it has remained strongly competitive.

An important limitation exists, however, now that the industry has expanded beyond its feed supply. According to any consideration of locational principles, this importation of feeds cancels out the major factor—freight cost advantages—which allowed the industry to develop in the first place. This applies only to that last increment of production which is dependent upon imported feeds. The bulk of the present activity remains on a sound economic basis, but an effective upper limit seems to be placed upon the size of the industry.

This limitation could be relieved by a number of possible developments which would augment the feed supply, including an increase in irrigated land, greater intensity of land use, and the introduction of higher-yielding crops. Furthermore, better utilization of feeds to obtain greater gains per unit of time and feed is also possible. Unfortunately, none of these eventualities offers any prospect of rapid and spectacular change.

It is more likely that the limitations on feed supplies will be intensified by several probable eventualities. The competition for limited amounts of agricultural land will probably become keener, and feed crops could be displaced by fruits, vegetables, or higher-income field crops. The demand for dairy products could result in stronger competition for the feed crops needed by dairying as well as by cattle feeding. This could drive feed prices to levels that would be uneconomic for feeding operations, and thus place progressively lower limits upon the economic capacity of the industry.

TWENTY-THIRD ANNUAL MEETING

University of Oregon

June 14-16, 1960

The twenty-third annual meeting of the Association was held at the University of Oregon, Eugene, in conjunction with the annual meeting of the American Association for the Advancement of Science, Western Branch.

Four half-day sessions were devoted to research papers and a business meeting. At the annual dinner Chairman S. N. Dicken called attention to the fact that the Association of Pacific Coast Geographers was celebrating its twenty-fifth anniversary; he also read the names of the charter members, some of whom were present.

The presidential address by Howard F. Gregor, "Agricultural Intensity and Its Regionalization," is printed in full in this issue of the YEARBOOK.

Program

BROOKE, CLARK H., *Portland State College*
"Preliminary Study of the Distribution of Famines and Acute Shortages of Food in Tanganyika, 1949-1958."

BROOKS, JAMES E., *Portland State College*
"Water Resource Problems of the Deschutes River Basin."

BROWN, ROBERT, *Oregon State College*
"The Peppermint Industry in the Pacific Northwest."

BROWNING, CLYDE, *University of Oregon*
"Selective Land Use."

CLEVINGER, WOODROW R., *Washington State Department of Agriculture*
"The Rhubarb Industry of Washington: Geographic Aspects of Production and Marketing."

COLE, CHESTER P., *Fresno State College*
"Problems Concurrent With Irrigation."

CRITCHFIELD, HOWARD J., *Western Washington College*
"New Zealand's Phormium Industry."

CURTI, G. PHILIP, *University of California, Los Angeles*
"The Isle of Man: Geographical Factors in the Evolution of a Political Enclave."

DICKEN, SAMUEL N., *University of Oregon*
"The Lower Marine Terraces of the Oregon Coast."

FREEMAN, OTIS W., *University of Arizona*
"Holden, Washington: The Life History of a Mining Camp."

HAMMILL, LOUIS, *University of Oregon*
"The Location of Sawmills in the Eugene-Friendship Area Prior to 1911."

HEINTZELMAN, OLIVER H., *Oregon State*
"Menton, France—A Study in Tourism."

JOHANNESSEN, CARL L., *University of Oregon*
"Relative Moisture Content of Soils on a Foggy Coast."

KENNELLY, ROBERT A., *Long Beach State College*
"Cattle Feeding in the Imperial Valley."

MARTIN, GENE E., *University of Oregon*
"Land Ownership in the Argentine Pampa."

MCKINNEY, WILLIAM M., *Southern Oregon*
"The Changing Role of Geography Within the Social Sciences."

MCKIM, CALVON, *Fresno State College*
"Drought."

MERRIAM, WILLIS B., *Washington State University*
"Reclamation in the Holland March Area, Ontario."

MILLER, ELBERT E., *Western Washington College*
"The Columbia Basin After Fifteen Years."

SOPHER, DAVID E., *Sacramento State College*
"Cultural Landscapes of Portuguese India."

SPATE, O. H. K., *Australian National University, Canberra*
"Fiji—People and Problems."

THROWER, NORMAN J. W., *University of California, Los Angeles*
"The Character and Effects of Contrasting Methods of Land Subdivision."